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ANATOMICAL CONSIDERATIONS IN PERITONEAL ADHESIONS

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IN considering visceral adhesions, it is convenient to divide them into post-operative and post-peritonitic, and into localized and general varieties. One is safe in assuming as a rule that localized adhesions are more likely to follow an operation, whereas general adhesions are produced by general peritonitis. General adhesions, if the patient survives the immediate effects of visceral limitations, are likely to give less symptoms than localized ones, because there is less danger of constriction and strangulation in such cases.

In the consideration of no surgical lesion is it more essential to keep constantly in mind the anatomy of the abdomen than in these cases, for the movable points of the gastrointestinal tract are more likely to be affected than the normally fixed ones. The vulnerable portions of the large intestine are the cæcum, the transverse colon, and the sigmoid flexure; of the small intestine, the pylorus, the beginning of the jejunum, and the ileum at its junction with the cæcum and the loop of the ileum which drops into the pelvis. The omentum should be considered alone, for very far reaching results are likely to arise from its faulty fixation to the underlying viscera or to the anterior abdominal wall. Suspended as it is from the stomach and transverse colon, any direct tugging or fixation of this organ must act first upon the transverse colon and then upon the stomach. The movable portions will be pulled downwards and the fixed portions are likely to be kinked. Not only does traction upon the mesentery act directly upon the transverse colon and stomach, but traction upon the mesentery of the transverse colon is likely to produce pressure by tension upon the superior mesenteric artery where it swings from the aorta down over the duodenum.

The most likely sequelæ of vicious omental adhesions are disturbances of digestion, referred first to the colon and second to the stomach. As traction acts more directly upon the former, tympanites and constipation without gastric involvement are likely to be the dominant symptoms. It is not unusual to have patients ascribe a more or less obstinate constipation to some previous abdominal operation. In many of these there has been bad fixation of the omentum with traction upon the transverse colon. In other instances a faulty position of the sigmoid is at the bottom of the trouble. When both the colon and the stomach are involved, in addition to the above narrated symptoms are superimposed those coming from a stomach acting against obstruction, manifested chiefly by eructations of gas and sour fluid, a full sensation or even distress after eating, and in the more chronic cases, symptoms of dilatation of the stomach.

Of the vulnerable points of the small intestine, the two chief ones are: the pelvic portion of the ileum from its dependent loop to its junction with the colon, and the other is at the duodenojejunal junction. As the pelvic and appendical areas are liable to be the focus of infection, with attendant adhesions, the ileum is especially liable to be affected. This particularly applies to local as well as general

Fig. 1. Exaggerated enteroptosis. The greatest care must be observed in the replacement of the intestines in such a case as this. If there is added to the ptosis fixation by omental or colonic adhesions to pelvic areas or anterior abdominal wall, most obstinate symptoms of gastric and intestinal tympanites or motor insufficiency may be added to those which have already existed.

adhesions. On the other hand, the jejunal fossa is only likely to be involved in the event of a general peritonitis. In the latter disease the patient usually occupies a recumbent posture, and purulent fluids drop back into the loins both through the action of gravity and the natural tendency for all fluids to be swept towards the diaphragm. This fact is the strong argument in favor of the Fowler posture in peritonitis.

The mesentery of the small intestine, as well as the large, offers an effective barrier to the progress of fluids, particularly in the inflamed peritoneal cavity, and pools of pus are likely to be found submerging the jejunum at the point where it perforates the mesentery. This, no doubt, accounts to some extent for the wretching and vomiting which persistently occur in peritoneal cases. In the event of recovery the consequent adhesions around this area and the plastering of the mesentery to the posterior abdominal wall both conspire in limiting the action of the jejunum, which normally is a flexible loop and cannot functionate properly when fixed. In the gastric disturbances following extensive peritonitis, not only should the pylorus itself be considered as a point of possible obstruction, but the duodenojejunal junction should always be carefully inspected. Localized adhesions involving the small intestine are much more likely to produce symptoms than general adhesions. The small intestine is disposed in well defined systems. The jejunum lies first in the left loin forming one section, then crosses to the opposite side forming a second, then back again to the left, merging into the third, or beginning of the ileum, then again to the right for the fourth, and then crosses to the left and back to the right as the fifth. It is found in both the embryo and the adult that the folds of the small intestine tend to occupy parallel lines. Normally there are no acute angles in its course as are found both at the beginning of the jejunum and the termination of the ileum. Unless, therefore, adhesions are so distributed as to produce acute angulation, symptoms are not likely to arise. This is constantly noted in surgery. When the abdomen is opened some time after general

Fig. 2. Various segments of colon. C., cæcum; T. C., transverse colon; S., sigmoid. (The latter has been placed in the plane it normally occupies, in Fig. 5 the same is shown in torsion); D., duodenum; J., jejunum; A., appendix.

peritonitis, one may find wide-spread adhesions, and yet few or no intestinal symptoms have been noticed previous to the operation. This is due to the fact that the intestines have continued to occupy their general parallel lines and also that the contents of the small intestine are fluid and that the peristaltic wave is propagated by the concentric ring-like action of the circular muscles. A fluid mass, therefore, is propelled with much greater ease, and without symptoms, even through adherent coils of intestine, than is possible with the inspissated mass that is found in the large intestine. On the other hand, a knuckle of bowel adherent in the pelvis and producing an acute angle, or to the anterior abdominal wall, may give rise to the most exaggerated and fatal symptoms. Hence the statement that localized adhesions are more serious than general adhesions in their immediate and ultimate effects.

To summarize, one may make the general statement that omental adhesions associated with traction, act directly upon the transverse colon and the stomach, limiting the function of both and giving rise to chronic symptoms, frequently classified under the glittering generality of indigestion. Kinking of the pylorus, direct tugging upon the superior mesenteric artery through bad fixation and consequent traction upon the omentum, and adhesions about the jejunum are all causes for gastric disturbances following local and general peritonitis.

Fig. 3. Redundant sigmoid flexure. The possibilities of distortion or volvulus in such an instance as this are quite manifest, particularly if the greatest care is not observed in properly replacing this loop as a concluding precaution in peritoneal technique.

Fig. 4. Volvulus of sigmoid and distortion of cæcum, leading to obstruction of ileum. This accident may occur through unskillful use of abdominal sponges. Particular care should be observed in the replacement of these portions of the intestines in cases of enteroptosis or of redundant sigmoid to avoid such a complication, for very obstinate tympanites or fatal obstruction may result from this neglect.

One may be guided to the location of adhesions by a classification of symptoms. Thus obstinate constipation without gastric disturbance suggests merely a distortion of the colon, whether in its transverse or sigmoidal sections. On the other hand, symptoms referable to the gastric area, such as eructations of gas and fluids, fullness after eating, with distress, should suggest the probability of the effects of the adhesions expending their force upon the upper intestinal tract.

The prevention of adhesions by the many means which have been suggested are very essential and need not be recapitulated. Two points, however, are worthy of being brought prominently into the foreground. For several

Fig. 5. Dissection showing distribution of superior mesenteric artery and its branches. The artery passes directly from the aorta over the duodenum as a sharp cord. The possibilities of acute or chronic dilatation of the stomach from anomalies or distortion of this vessel after operation are vividly demonstrated. S. M. A., arteria mesenterica sup.; A. C. D., arteria colica dextra; A. I. C., arteria ileocolica; A. J., arteria jejunalia.

years it has been my custom, at the completion of every abdominal operation, unless there was some lesion or operation upon the colon contraindicating its hydraulic distention, to give by enema, while the patient is still under the anæsthetic and in the Trendelenburg posture, from one and a half to two liters of salt solution. Through many observations we have found that not only is the entire colon partially filled, but that the fluid frequently backs out in a serpentine wave through the ileocæcal valve into the ileum. In this way the transverse colon is naturally dropped back by the weight of the fluid into its normal situation, and the sigmoid flexure is untwisted and assumes its natural situation, if it happens to occupy, through the distortion of packs or operative manipulation, a bad position in the pelvis. The fluid, if the patient is still under the anæsthetic and if care is observed in placing her in bed, is almost invariably retained, and acts as a splendid stimulant in overcoming shock, the refrigerant effects of the anæsthetic, and the excess of stress thrown upon the kidneys. This was our primary object several years ago in thus employing salt solution, but in the light of subsequent observation of our cases it has been found that not only is immediate post-operative tympanites of very much less frequent occurrence, but the ultimate convalescence and freedom from post-operative sequelæ incident to adhesions have been greatly minimized. In other words, the transverse colon acts, when thus employed, as a most serviceable hot water bag applied directly to the sympathetic system and great vessels. The fluid is rapidly absorbed, and not only gives the patient the stimulating value of the heat, but the even greater benefit of a large volume of fluid. Through our observations with this plan, we are led to the view that in many instances not only tympanites but ultimate difficulties in the digestive tract arise more from improper disposal of the viscera during or at the completion of an operation than from the usually assigned causes.

So impressed are we by the numerous cases which have come under observation in which

Fig. 6. Duodenojejunal fossa. In general peritonitis this fossa is flooded with pus. Post-operative adhesions and their subsequent shrinkage may produce serious dyspepsia. (A partial obstruction.) Ptosis of the cæcum is also well illustrated. The clumsy disposal of such a cæcum after an operation may lead to iliac obstruction.

Fig. 7. Sigmoid and colon filled with water. The rectal injection of from one to two liters of saline solution at the conclusion of an abdominal operation, while the patient is under the anæsthetic, adjusts the sigmoid flexure, drops the transverse colon back into its normal situation, and partially fills the ascending colon. The subsequent radiation of heat from this natural hot water bag expends itself in immediate contact with the large abdominal blood-vessels and the sympathetic system thus combating shock. The gradual absorption of this volume of fluid decreases thirst and more than doubles urinary excretion, largely obviating the danger of post-operative renal and vesical complications.

exaggerated disturbances of digestion have come from omental adhesions, that we no longer make strenuous attempts to envelop operative areas with this membrane. If the omentum is a long, dependent organ it can be used in this way without any traction upon the colon and stomach; on the other hand, if it is necessary to pull down the transverse colon in order to avail one's self of this protective action, the policy is unquestionably bad, and the ultimate vicious effects of this fixation far outweigh the possible immediate protection of the patient against peritoneal involvement. The omentum is the surgeon's friend, but like other willing horses it cannot be treated with impunity, and must have consideration.

THE OPERATIVE TREATMENT OF PUERPERAL THROMBOPHLEBITIS

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FOR many years I have made it a practice to treat all cases of puerperal infection in the most conservative fashion. Except for irrigation of the uterine cavity where a foul discharge persisted, of opening of abscesses through the cul-de-sac or extraperitoneally above Poupart's ligament, the treatment consisted solely in fortifying the general body resistance by all means at our disposal.

The reckless use of the curette, which often serves to open new channels of infection; the application of strong antiseptics which further devitalize tissues already reduced in vitality; the radical removal of the uterus, which lays bare large areas of connective tissue to the invasion of the streptococcus, never appealed to me. But in the last few years authoritative voices have spoken strongly in favor of operative interference in a small group of cases, occasionally presenting themselves in the course of puerperal infection. These cases of pure thrombophlebitis unassociated with lymphangitis or peritonitis, appear to present a definite symptom complex which should permit of diagnosis. As the outcome without interference in almost every instance is fatal, and, as a few reported cases are now on record, I no longer felt justified in adhering to my long established attitude of non-interference.

While still in this uncertain frame of mind a case presented itself in my service at the Mt. Sinai Hospital, which corresponded in nearly every detail to the type described by those most familiar with this as yet little explored field.

Under the circumstances it seemed unfair to the patient to withhold the only possible means of relief, although my personal convictions were divided.

The following is a history of this patient: F. K. Admission No. 105,757, admitted on January 9, 1909, died January 26th. The patient was 21 years of age, a primipara. The previous history was negative. Eighteen days before admission she had been delivered at term without interference and *without a single vaginal examination* by the physician in charge. The succeeding day some abdominal pain was felt, but the condition for the next three days remained satisfactory. On the fifth day there was abdominal pain, vomiting, and a severe chill. Since then the chills have recurred twice each day, the temperature ranging from 98.6 to 106°. *Examination* showed a young woman, well nourished, with flushed cheeks and septic in appearance. Anæmia was very marked. There were no petechiæ. The inguinal glands were slightly enlarged. A systolic murmur was heard at the apex and base; the second pulmonic sound accentuated. The spleen edge was plainly palpable. The abdomen was not distended; there was tenderness to pressure on the left side below the umbilicus.

The vulva and vagina were negative, the uterus proved but slightly enlarged, well involuted and retroposed. Both parametria gave the impression of being shortened, but there was no mass nor increased resistance. The other viscera were negative; no œdema of the legs.

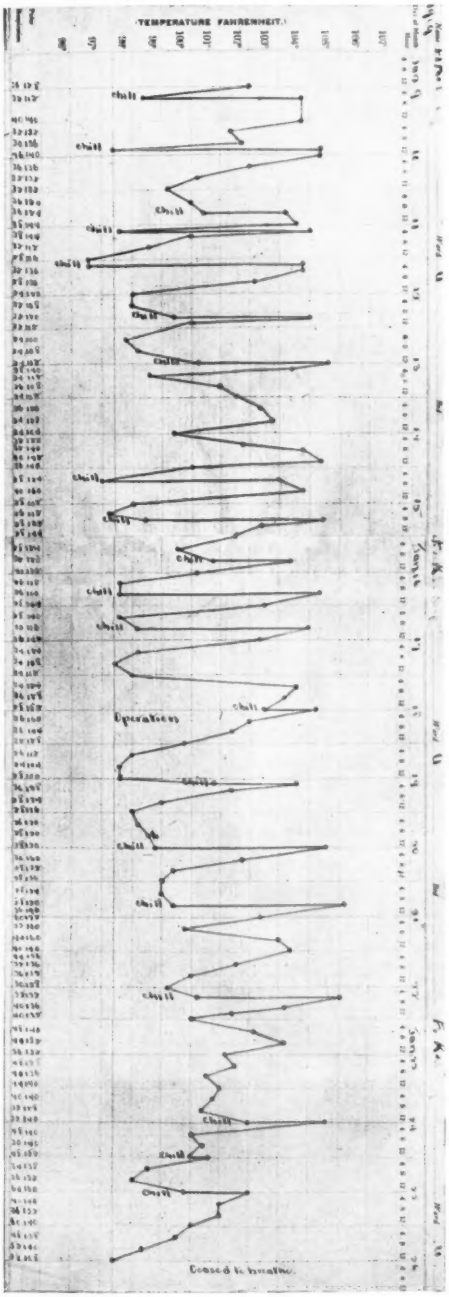
After admission the chills appeared once or twice daily (see chart), the general condition showing a gradual change for the worse. On the fourth day of her hospital stay, pain and friction sounds developed in chest at the base, and in the axilla of the right side. The next day it was noted that the superficial veins over the lower part of the abdomen were unusually distinct and somewhat dilated.

Although the cervix barely admitted the tip of a finger, it was deemed wise to determine whether any retention of lochia had occurred; the irrigating fluid however, returned nearly clear.

A blood culture taken the day after admission proved negative; the urine contained no micro-organisms. The leucocyte count was raised to 32,000 W. B. C., differential count showing 78 per cent polynuclear, 14 per cent lymphocytes, 6 per cent large mononuclear cells, and 2 per cent transitionals. The Hg. was 40 per cent.

For nine days after admission the general picture remained unchanged, except that on the whole the patient slowly lost ground. The chills recurred with monotonous regularity. The day before operation was decided upon, the W. B. C. had fallen to 18,000, the polynuclear count risen to 87 per cent, the lymphocytes to 13 per cent. The Hg. was now 35 per cent.

The above history, course, and physical findings could be interpreted in but one way. Infective germs had entered the uterus and from there had spread into the vascular channels. Everything pointed to the fact that the uterus itself, the peritoneum, and the pelvic connective tissues were uninvolved. The general condi-



tion of the patient was steadily growing worse, and, unless the time for interference had already passed, ligation of the pelvic veins as advocated by Sippel, Freund, Trendelenburg and Bumm was urgently indicated. With the prospect of nothing to lose and everything to gain, I determined to operate.

Jan 18. Ligation of both ovarian veins. Gas and ether anæsthesia; time 33 minutes. Six-inch median incision; uterus very slightly enlarged and normal in appearance, adnexa negative, free, no adhesions or exudation anywhere. The peritoneum over the left ovarian vein was incised, the vein freed, doubly ligated with silk, and cut across. The lumen contained fluid blood. The hypogastric vein was then exposed and palpated. It also proved negative.

On ligating the left ovarian the *broad ligament immediately became enormously distended*. Considerable clear serum exuded from the parametrium. The same steps were performed on the right side, both slits in the peritoneum being closed with catgut. Closure of abdomen followed. The patient's condition throughout was poor, requiring stimulation. There was no chill the day after operation, but thereafter the chills returned with undiminished regularity and unchecked severity until a few days before death. Cough and expectoration developed. The condition grew steadily worse as shown in the chart by the increased pulse rate and more frequent respirations. Coma appeared before death, which took place eight days after operation.

As seen from this the disease progressed unchecked and unchanged to a fatal termination. At autopsy the conditions were the following:

Post-mortem. The abdominal wound, though closed and apparently uninfected, showed no signs of healing. There was no evidence of peritonitis. The peritoneal cavity was negative. The uterine cavity contained a raised, necrotic area, corresponding to the placental site. The ovarian veins were found filled with fresh uninfected blood clots extending from the site of ligation to the uterus. The ligated cut ends had healed perfectly. Both uterine and hypogastric veins were negative.

The left common and external iliac was filled with semifluid, purulent material, which could also be milked upward from the left femoral vein. The right common iliac and the right external iliac veins were unaffected. In the vena cava inferior a thick, adherent, purulent thrombus extended from the beginning of this vein to the diaphragm. The lungs were riddled with abscesses, one of which had caused necrosis of the overlying pleura. These abscesses corresponded accurately to the distribution of the pulmonary artery. The other abdominal viscera were negative, except for moderate parenchymatous changes. The peritoneal wounds in the broad ligament had healed. There was no œdema of the left leg.

To recapitulate: We were dealing with a severe, but not hyperacute case of pure thrombophlebitis, in which, at operation, only the two ovarian veins were tied, the hypogastric and median pelvic veins (Kownatzki) showing no evidence of involvement. As was further demonstrated at autopsy, none of the veins in the true pelvis were affected, lesions being found only in the left common and external iliac, the left femoral veins and in the vena cava. The process, which may be compared to that sometimes seen in the glandular involvement of carcinoma of the uterus, had skipped the intermediate links of the chain and had become localized in regions inaccessible to interference. This discontinuous mode of progression cannot be excessively rare, for in my own limited experience, I have noted it twice in a series of but nine cases of thrombosis which came to autopsy.

The reports found in the literature emphasize this fact. Grossman in 27 cases of thrombophlebitis, found cava thrombosis in three; Trendelenburg in 21 noted 9 affecting the cava or the common iliacs; Lenhartz in 32 found 4. In my own cases 4 out of 9 showed the cava involved.

Undoubtedly at a certain stage of the disease the bacterial emboli which produce the involvement of the extrapelvic veins are carried through the four cardinal veins of the uterus — the ovarian and uterine — or through the median pelvic veins and such anastomoses as may exist with the external iliacs, obturator, epigastrics, etc. Were we able to tie off the afferent trunks before this occurrence, the disease should, and in a few instances has apparently been favorably influenced by operation. If the ovarian or other pelvic veins are actually thrombosed, and this happens in the majority of cases, the conditions are slightly more favorable than if a free and therefore more active circulation is maintained through these large blood channels. When all the large pelvic veins are occluded, the uterus, which can remain the hotbed of infection, is obliged to send out its new thrombi through small and devious paths which favor the arrest of the emboli in less vital spots. Renewed sources of infection are then limited to the ends of the thrombi which project out into the still circulating blood. In these cases ligation should prove most effective.

On the other hand the temptation arises to tie off the veins early, or even prophylactically.

With this end in view numerous earnest investigators have sought to determine by the careful study of large series of cases whether it is possible to recognize thrombophlebitis at its earliest inception. As chills are one of the most constant symptoms of this treacherous malady, it is not surprising that Bucura and Trendelenburg lay great weight upon their occurrence. The former would operate after the fifth chill, the latter after the second.

Unfortunately, experience has amply proven that such rules, though tempting, are fallacious, and that the problem is far too complex to permit of any such rule of thumb. In the first place, chills may occur independently of thrombophlebitis; they sometimes are seen in the course of puerperal peritonitis, which in itself is a contraindication to ligation of the veins. The symptoms of peritonitis, however, have a sufficiently characteristic aspect to permit of their exclusion. In pelvic lymphangitis, on the other hand, the involvement of the surrounding connective tissue may be so minimal as to simulate quite accurately the often described worm-like strands supposedly pathognomonic of thrombosed veins.

Pelvic lymphangitis has been generally recognized as a "noli me tangere" as far as intraperitoneal manipulations are concerned, although some of the bolder spirits are willing, and have actually proceeded to ligation, in the face of this added complication, which increases the danger of infection in the course of a laparotomy and renders the freeing and exposure of the veins technically more difficult.

Secondly, chills occur also in the course of simple bacteræmia without venous involvement.

Here, in particular, local pelvic symptoms are minimal or absent, just as in the cases of thrombosis of the veins. In very acute infections, which form the majority, the question of operation would not arise, but with a more chronic course, the resemblance to the form of disease under discussion is striking.

Blood cultures, as will be shown further on, are of no great value in differentiating.

Thirdly, wide-spread thrombosis may be

present, and yet not a single chill manifest itself. This may be due to insufficient reaction in consequence of a greatly debilitated general condition; but no matter what the anomalous course is due to, it robs us of one of the most striking symptoms and guides.

These varieties of conditions just enumerated, have all been observed by me and have served to impress upon me the great and almost insurmountable difficulties which confront us. Let me instance a few striking examples.

R. F. 22 years of age. Primipara, delivered instrumentally 3 days before admission. The first chill occurred on the seventh day post-partum, and from then on, chills recurred almost daily. The uterus was small and soft; there were healing perineal and cervical tears. Except for indefinite signs in the lungs, the general physical examination was negative. Throughout her hospital stay (20 days) the temperature was markedly septic in character, rising to 105° to 105.8 after each chill. The W. B. C. was 13,800, falling gradually to 7,800.

On the fifteenth day, blood culture proved negative; not until a week before death, which took place on the 33d day, were streptococci found in the blood.

At autopsy, a necrotic endometrium, ulcerative endocarditis, and infarcts in various viscera were found. *The veins throughout the body were negative.*

The preceding case illustrates a bacteræmia in which the blood culture became positive very late in the course of the disease, in which chills were frequent, and yet thrombosis absent.

W. N. 27 years old. IV para; had an instrumental delivery. No chills developed until the last week of the disease, *which was twelve weeks in duration.* At autopsy, *unilateral thrombosis of the ovarian and uterine veins was found.*

The following case, more acute in its course, showed but four chills in 17 days.

K. O. 23 years of age, had a spontaneous (?) abortion at the third month. Her temperature was of high septic type. Local signs were wanting. The blood culture showed streptococci on the 13th day. At autopsy there was found endocarditis, multiple infarcts, and *thrombosis of the left uterine, internal, and common iliac veins.*

Other investigators have recorded similar cases, for instance, Seegert, who reports two cases of thrombophlebitis without a single chill. Chills are by far the most conspicuous symptom usually associated with thrombophlebitis, but in the vain search for some pathognomonic, or at least approximately certain symptom, painstaking investigators have sifted almost every imaginable possibility.

Mahler's symptom, the climbing pulse, has proven illusive. Blood cultures, as previously mentioned, have not fulfilled the hope once entertained as to their value. Lenhartz, Libman and others have abundantly demonstrated that bacteria in the blood appear and disappear in the course of general infections, depending partly upon the stage of the disease at which the examination is made. In my own cases, the blood cultures, as reported by Dr. Libman, in some instances were positive, in others negative. If any conclusions were to be drawn, they would be that the blood is more often sterile, at least in the late stages in thrombophlebitis, than in the other forms of puerperal infection. Whether this is due to the fact that the germs in this type of infection are but mildly virulent when compared to the germs of acute sepsis, as has been shown by the animal experiments of von Bardeleben, is not proven.

It is useless to enter into a detailed description of other symptoms which have been studied, into a discussion of the value of the leucocyte count, and similar examinations. All have proven subsidiary or quite negligible.

Finally, a careful perusal of the literature only serves to show the great diversity of opinion entertained by various members of the profession. No consensus of opinion is even held upon the important subject of the mortality rate in puerperal sepsis and in thrombophlebitis.

Olshausen and Seegert, for instance, believe that 71.5 per cent recover without interference, v. Winckel that but 7 per cent do not die.

In 965 cases of severe puerperal infection collected from the literature, 461 died, a mortality of 47.5 per cent.

Bearing the foregoing in mind it is of no value to attempt to draw deductions from the 44 or 46 cases of operative intervention on record, because the number, even if observed in the practice of a single surgeon would yet be too small to prove conclusive; while these cases are collected from no less than 15 sources, without the possibility of subjecting them to any definite or uniform criteria. For we must all agree that as yet we have no sure means of classifying these cases, except at the autopsy table, when they have run their complete and final course, and have arrived at a stage which

most likely no longer corresponds to the period of interest to us in our investigation.

Furthermore, my single operative intervention convinces me that at operation we are not in a position to judge the distribution and the extent of involvement present, unless the lesions are well-marked and limited to the large pelvic veins. Small lesions may escape the most careful inspection and palpation; the vena cava may appear normal and yet harbor a large parietal thrombus; the external iliac or even the femoral veins may be affected.

On the other hand, infected lymphatics palpated through the broad ligament may be mistaken for thrombosed veins and may cause a conscientious surgeon to report a cure of a non-existent condition. Therefore I shall not attempt to sift or discuss the cases recorded, particularly as I feel convinced that one or two at least, ought to be discarded if subjected to an impartial but searching critique.

The question is not one of statistics, certainly not at this early stage. We must all act according to our best judgment and try to learn from our personal experience.

Something I have already learned. In a properly selected case — here chance still plays a considerable part until our diagnostic skill has advanced — the operation ought not to prove very dangerous. Technically, in patients not too stout, it is fairly simple and of short duration, if no adhesions are encountered. The peritoneal wound, contrary to what theoretically should occur, heals well. If on ligation of a vein, undue distention of its peripheral distribution takes place, compared to that noted when tying the opposite side, I should in future regard this sign as significant of involvement of other large veins on the affected side. Ligation of *all* the pelvic veins, unless strongly contraindicated by the condition of the patient, should be practiced in every instance as a routine measure.

The question which, however, is of greatest importance, I hesitate to attempt to formulate in as didactic a manner as the preceding. *When or how early should we operate?* The conservative surgeon will possibly in a given case be too conservative, allow the proper time to pass, and operate too late. The man of more sanguine temperament, or of less experience, will surely ligate in cases where no indication exists, but he may save a case here and there, which would have succumbed if delayed. Who of the two in the long run will have more cures and more deaths to his credit, will remain for the course of time to show.

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THE ETIOLOGY OF CHOLECYSTITIS[1]

AN EXPERIMENTAL STUDY

BY J. EARL ELSE, PH. G., B. S., M. D., PULLMAN, WASHINGTON

BACTERIOLOGICAL examinations of the bile in cases of cholecystitis reveal several varieties of organisms. Petersen in a series of calculous cholecystitis found the bacillus coli alone thirty-six times, associated with the staphylococcus six times, and with the streptococcus four times. Hartman in thirty-six cases in which he found organisms, found the bacillus coli alone in twenty-three cases, the staphylococcus pyogenes albus and aureus in three, the staphylococcus pyogenes albus in one, the streptococcus in two, and the streptococcus with other organisms in three. Funke in thirty cases in which he found

[1] Read before the meeting of the Medical Associations of the Pacific Northwest, July 21, 1909.

bacteria, found the colon bacillus in pure culture in eleven cases, the typhoid bacillus in pure culture once, and associated with other organisms occasionally, and the bacillus subtilus once. He also found the bacillus of Friedlander, the bacillus lactis erythrogenes, the bacillus limbatus, the bacillus gasoformans, the bacterium oxygenes, the micrococcus tenacatis, and the sarcina lutea. The last organism occurred four times but always in association with other bacteria. Pratt has called our attention to the frequency of the typhoid bacillus as an etiological factor. Flexner and Chiari found it almost constantly present in the gall-bladders of patients dying of typhoid fever. Hunner reports an instance where the typhoid bacillus was recovered from the gall tract eighteen years after the initial infection and Droba another where it had persisted for seventeen years. Anders reports three cases of cholecystitis complicating pneumonia. Pearce reports finding the leptothrix in one case.

In studying the literature it will be noticed that the organisms usually found producing cholecystitis may be readily divided into two classes:

1. Motile organisms found either constantly or occasionally in the intestines; namely, the colon bacillus, the typhoid bacillus, and the bacillus subtilus.

2. Those organisms most commonly recovered from the blood in cases of bacteræmia, namely, the streptococcus, the staphylococcus, the typhoid bacillus, and the pneumococcus. This might be taken to indicate that the two most frequent routes of infection to the gall-bladder are by way of the bile ducts and through the general circulation.

The source of the infection may be in any portion of the body but is most commonly in the intestines.

The infective organisms were formerly supposed to have reached the gall-bladder from the intestines by ascending the common and cystic ducts. Recently this theory has been assailed in several quarters and some authors even go so far as to state that this is the rare route.

The work of Adami, Wrzosek, Ford, and Lartigan would go to prove to us that bacteria may reach the different organs by way of the blood stream from the bowels. According to Adami, bacteria are constantly passing through the intestinal wall along with the natural process of digestion. If this be true we should expect to find organisms normally in the normal tissues. This is opposed by many prominent observers. Hauser found the normal tissues invariably sterile as did also Neisser. Morgan, although occasionally finding organisms in normal tissues, regarded them as a contamination. Ford, on the other hand, believes that organisms are found in the normal tissues, and attributes the failure of some observers to find them as due to too short a period of incubation for the cultures.

Regarding the manner in which the bacteria reach the general circulation from the intestines, there is also a difference of opinion. As has been stated, Adami believes that the organisms reach the portal vein during the normal process of digestion by being carried by the leucocyte from the lumen of the gut to the radicals of the portal vein along with the food. Wrzosek objects to this, claiming that the bacteria are picked up by the lacteals and reach the general circulation through the thoracic duct. In proof of his theory he gives us the result of two series of experiments. In the first series the animals were simply fed upon food contaminated with some easily recognizable organism not commonly found in the intestines of the animal experimented upon. Two or three days later the animals were killed and cultures made from the different organs. The organisms were usually recovered from the mesenteric glands and often from the liver, spleen, and kidneys. In the second series, previous to feeding the animals the contaminated food, the thoracic duct was ligated and in this series the organisms were only rarely recovered from the organs. The fact that the organisms were rarely found when the thoracic duct was ligated and were most frequently found in the mesenteric glands when the thoracic duct was not ligated, would go to prove that the lacteal route is the most common one.

In proof that the organisms may reach the gall-bladder by other routes than by way of the bile ducts, Lartigan ligated the common duct in ten dogs. To five of these he fed small doses

of either arsenic or bichloride of mercury in order to produce an ulcerated condition of the bowels. Then he fed them on food contaminated with the bacillus pyocyaneus. The other five were fed upon the contaminated food without having first produced the experimental lesion. In the first series the organism was recovered three times from the gall-bladder, and in the second series twice, thus proving that infection can reach the gall-bladder from the intestines by other channels.

In reviewing the work of these men three questions naturally arise:

1. Does the finding of bacteria in normal tissues prove that these bacteria passed through the intestinal wall into the circulation by a normal process?

2. Do the organisms reach the general circulation from the intestines through the portal system or through the lacteals? and

3. Do organisms from the intestines usually reach the gall-bladder through the portal system or through the bile ducts?

In answer to the first question we know that no person goes for any great length of time without at least some slight manifest lesion of the mucous membrane of the intestines, and there is probably no time when at least some microscopic lesions do not exist. Further, we know that when lesions are present bacteria pass through them. This has been demonstrated by every clinician by obtaining typhoid bacilli from the blood in typhoid fever. In view of these facts, it would seem that although if it were possible for organisms to enter the portal radicles as Adami believes, they would be insignificant in numbers as compared with those passing through the ever present lesions.

In answer to the second question, if the work of Wrzosek proves anything it proves that the usual route to the general circulation from the intestines is through the lacteals and thoracic duct. Lartigan's work has no bearing upon this question for he failed to recognize the possibility of the lacteal route. His work simply proves that the organisms can and do reach the gall-bladder through another route than by the bile ducts.

This work was undertaken to throw some light if possible upon the third question. In this work the bacillus pyocyaneus was used, being injected into the viscus with a hypodermic needle under strict aseptic and antiseptic precautions. Cultures were made from the gall-bladder of several of the animals at the time of operation to determine if the bacillus pyocyaneus is ever found in the gall-bladder of these animals. In no instance was it obtained.

SERIES I

Problem. Do organisms readily ascend the bile ducts from the duodenum in the presence of an impaired peristalsis?

Group 1. Technique. A ligature was placed about the duodenum just above the entrance of the common duct and another was placed about twelve or fifteen centimeters lower and into this loop two cubic centimeters of a virulent culture were injected.

No.	Animal Used.	Date of Exp.	Hours Elapsed Before Culture Made.	Result.
1	Belgian Hare	Mar. 18	24	Positive
2	" "	" 27	12	Negative
3	" "	" 27	26	Positive
4	" "	" 30	28	Positive
5	" "	April 1	30	Positive
6	Dog	" 13	52	Positive

Group 2. Control. Technique. Two cubic centimeters of the virulent culture were injected into the stomach with no interference with the duodenum.

No.	Animal Used.	Date of Exp.	Hours Elapsed Before Culture Made.	Result.
1	Belgian Hare	April 1	48	Negative
2	" "	" 3	52	Negative
3	" "	" 3	52	Negative

This series demonstrates that although organisms may not readily ascend the common and cystic ducts to the gall-bladder under normal conditions, when peristalsis is impaired they not only readily enter the common duct but usually do, there being only one experiment in which infection of the gall-bladder did not result. In this experiment, the second in the series, the animal did not completely recover from the anæsthetic, dying in twelve hours. Had I made cultures from the common and cystic ducts I would probably have recovered the organisms, for Myake in a large series of normal animals invariably found organisms, usually the colon bacillus, in the common duct and the ampulla of Vater, although the gall-bladder and cystic and hepatic ducts were

sterile. Netter and DuClaux obtained similar results.

In studying the history of the cases of chronic cholecystitis it is found that one of the most common predisposing factors is constipation. Particularly is this true in the calculous variety. With the lax condition of the bowel there is also a relaxation of the musculature of the gall-bladder and ducts. Further, when there is a torpid condition of the bowel bacteria are found in greater numbers. So here in the patients is the very same condition that I have produced in the animals; namely, an impaired peristalsis with an increased number of bacteria.

SERIES II

Problem. To demonstrate the possibility of infection reaching the gall-bladder by way of the portal vein in the presence of small lesions in the mucous membrane of the intestines.

Group 1. Technique. A loop of ileum fifteen or twenty centimeters in length was ligated off, and an experimental lesion produced in the mucous membrane by scratching it with the hypodermic needle, at the same time two cubic centimeters of the culture were injected.

No.	Animal Used.	Date of Exp.	Hours Elapsed Before Culture Made.	Result.
1	Belgian Hare	April 1	16	Negative
2	" "	" 2	32	Negative
3	" "	" 2	24	Negative
4	" "	" 2	56	Negative
5	" "	" 3	53	Negative
6	" "	" 4	52	Negative

Group 2. Technique. The common duct was ligated and two cubic centimeters of the culture were injected into the stomach in the first and second, and into the duodenum in the third experiment.

No.	Animal Used.	Date of Exp.	Hours Elapsed Before Culture Made.	Result.
1	Dog	Feb. 16	48	Negative
2	"	" 22	72	Negative
3	"	" 22	72	Negative

This series would tend to show that organisms do not readily reach the gall-bladder from the intestines through the portal circulation, at least when the lesions in the mucous membrane are small.

SERIES III

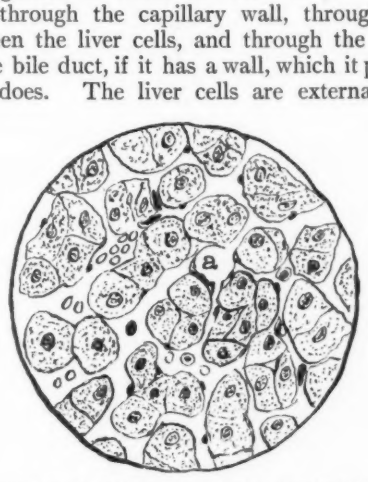
Problem. Should infection pass into the portal vein from the intestines, as claimed by Adami, would it reach the gall-bladder by passing into the bile ducts in the liver?

Technique. Two cubic centimeters of the culture were injected into the portal vein in the first dog and four in the second.

No.	Animal Used.	Date of Exp.	Hours Elapsed Before Culture Made.	Result.
1	Dog	May 5	32	Negative
2	"	" 22	103	Negative

This work, although small, would indicate that even were organisms to reach the portal vein from the intestines they would not enter the hepatic ducts. This agrees with the work of Carmichael.

If we refer to the histology of the liver this is just what we should expect for we find that the interlobular veins of the portal system terminate in capillaries which empty into the intralobular branches of the hepatic veins. The liver cells are arranged in groups in the meshes of the capillaries in such a manner that at least one side is in contact with the capillary wall. The terminal bile ducts lie in the centers of groups of cells. By consulting the illustration it will be seen that the natural course for the organisms is to pass through the capillaries into the intralobular branches of the hepatic veins. In order for an organism to reach the bile duct, it must pass through the capillary wall, through or between the liver cells, and through the wall of the bile duct, if it has a wall, which it probably does. The liver cells are external to



Human liver (slide No. 522, author's collection), X 1,000. a. Intralobular vein. Bile capillaries are seen within the groups of cells. Blood corpuscles are seen between the groups of cells.

the capillary walls and cannot pick up organisms out of the blood stream as can the leucocytes.

But if organisms cannot reach the gall-bladder by way of the portal vein and the liver, in what manner do they reach the gall-bladder from the general circulation? That they do is proven by the work of Futterer, Blackstein, and Dörr who injected organisms into the superficial veins and then recovered them from the gall-bladder. When organisms are injected into the general circulation they can be recovered from other organs than the gall-bladder. They reach these other organs through the arteries. Now, then, if it is possible for organisms to reach other organs through the arteries, it must also be possible for them to reach the gall-bladder through the arteries. The gall-bladder, cystic duct, common duct, and at least the lower portion of the hepatic ducts are lined by mucous membrane. This mucous membrane is supplied by arterial blood and one of the functions of this membrane is to secrete, so that were bacteria to be brought to this membrane some of them would undoubtedly pass through into the bile. This is a route which infection might take but before we can make any definite statements the following problems must be worked out:

1. Route by which organisms reach the general circulation from the intestines:

a. Through the lacteals and the thoracic duct.

b. Through the portal vein. Some work has been done along this line but it requires more.

2. Route by which organisms in the general circulation may reach the gall-bladder:

a. Throught the cystic and hepatic arteries.

b. Through the portal vein.

I hope to be able to report upon these problems some time in the near future.

CONCLUSIONS

1. Motile organisms can and usually do reach the gall-bladder from the intestines by ascending the common and cystic ducts.

2. Organisms rarely if ever reach the gall-bladder from the intestines by way of the portal vein. The tubercle bacillus and the amœba coli are probably exceptions to this. But these organisms produce an infection of the liver first, and an infection of the gall-bladder is secondary to the liver infection. These organisms extend deeply into the intestinal wall and probably enter the smallest branches of the portal vein directly.

3. Infective organisms can reach the gall-bladder through another route, the exact course of which must be worked out.

In conclusion I wish to express my appreciation to the Department of Veterinary Medicine at the State College for the use of their laboratories and operating room, and for the many kindnesses shown me in this work, and especially, to Dr. J. A. McKibben, who so faithfully assisted me.

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THE RELATION OF THE THYROID GLAND AND THYROIDISM TO THE TOXÆMIA OF PREGNANCY[1]

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SINCE Parry first clearly described a case of undoubted exophthalmic goiter seen by him in 1786, to the present day, there have been a great variety of theories advanced by numerous contributors to medical literature, in an endeavor to solve the riddle of the thyroid gland in both its physiological and its pathological aspects. The early theories were purely speculative, but in recent years the more exact methods of scientific research which increased laboratory facilities have made possible have placed later investigations on a more solid basis. While important advances in our knowledge of the thyroid gland and its diseases have been made, yet there still remains much that is obscure; in fact the lifting of the veil by recent investigators has simply sufficed to show us how complex a problem still remains for solution.

What has just been said of the thyroid gland may be applied with equal force to the problem of the toxæmia of pregnancy. That there is some relation between the thyroid gland and the pregnant state is an accepted fact. That there is a relation between the diseased thyroid and some of the metabolic disturbances of pregnancy, is strongly probable. In view of the laboratory evidence at hand, it certainly gives promise of a fruitful field for research.

To study the relation of thyroidism to the toxæmia of pregnancy in the light of some of the recent researches as to the nature and treatment of Graves' disease is the purpose of this paper.

THE PHYSIOLOGY OF THE THYROID GLAND

The results of the investigation of recents years have placed the thyroid gland and the parathyroids as vital organs. The complete removal of the thyroid and the parathyroids in mammals results in tetanic convulsions and sudden death in the great majority of cases. This was observed by Schiff as early as 1857, and he repeated his experiments with similar results in 1883; but the fact was made especially prominent after Kocher and Reverdin reported fatal results in complete thyroidectomy in the human subject. The removal of the thyroid alone, produces a general cachexia. This condition can be relieved by the administration of thyroid substance. If the parathyroids are completely removed, an acute fatal tetany results in a few hours. The functional importance of the thyroid apparatus seems to be greatest in early life.

Wagner has shown that if one lobe is removed, the other hypertrophies; this is constant in young animals, and shows the importance of the gland in the economy. The thyroid secretion in some way exerts a profound influence upon nitrogenous metabolism. Where the function of the gland is active, there is a decided increase in tissue changes, while if it is deficient, these changes are diminished.

Robert Hutchinson, in a review of the literature upon the effects of thyroid extractives on metabolism says: "It may be said that the effect of the administration of the thyroid is to increase the oxidation in the body; it makes the tissues, as it were, more inflammable, so that they burn away more rapidly. The products of the disintegration of the nitrogenous tissues appear in the urine almost entirely in the form of urea, uric acid, and the xanthin bases, while the products of the fat destruction are eliminated as CO_2 by the lungs, and water by the kidneys."

Sajous states that recent investigations have but confirmed these deductions of Hutchinson. Underhill and Saiki have recently made a series of experiments upon the influence of thyroidectomy and of thyroid feedings on metabolism, and they found that after complete thyroidectomy and parathyroidectomy in dogs the

[1] Thesis presented for Fellowship in the American Gynecological Society, April, 1909.

ammonia output in the urine was increased even beyond what is observed in starving animals. The urinary nitrogen eliminated as kreatinin, purin bodies, and allantoin, is about equal in amount to what has been noted in fasting dogs. As in normal fasting dogs, a variable, and frequently not inconsiderable, output of kreatin was observed.

They found that thyroidectomized dogs are incapable of utilizing subcutaneously introduced dextrose, in anywhere near the same degree as normal animals. It is thus suggested that the loss of the thyroid glands may occasion a change in the gaseous metabolism similar to that which has been observed in myxedema, cretanism, etc. Thyroid tissue, fed to normal dogs, causes a slight increase in the urinary nitrogen excretion, and this influence soon disappears on the withdrawal of the thyroid substance. Small doses of thyroid appear to have as pronounced an influence on nitrogen elimination as larger ones. A larger output of purin-nitrogen and a low output of phosphorus were observed after the continued administration of large doses of thyroid tissue. Thyroid feeding produces little change in the interrelation of the nitrogenous urinary constituents. This is in harmony with the accumulating evidence that these relationships are upset only by exceptionally profound disturbances in the nutrition of the cells.

Chemical studies of the gland have shown that the proteid can be separated into nucleoproteid, thyreoglobulin, and albumin. The normal thyroid contains relatively little nucleoproteid and much thyreoglobulin. Beebe found in extracting many glands of exophthalmic goiter that there was a much larger proportion of nucleo-proteid, especially in the fatal cases.

It is probable, according to recent investigations, that the parathyroids elaborate an internal secretion which is of vital importance. The tetany which is the result of the complete removal of the parathyroids is not unlike the symptoms of tetany and eclampsia in the pregnant woman. That a disturbance of their function may have an important relation to the toxæmia of pregnancy is not improbable, but as yet the subject is too little understood and we must await the results of further experimental work.

Vassale, Zanfrognini, and Edmunds, among others, have made studies of the relation of the parathyroids to eclampsia. Beebe has been able to promptly relieve the symptoms of tetany in parathyroidectomized dogs by the hypodermic administration of fresh parathyroid nucleoproteid. Beebe and Berkeley, who have done considerable experimental work on the parathyroids, suggest that they may furnish enzymes which are of prime importance in the intermediary metabolism of nitrogen.

THE RELATION OF THE THYROID GLAND TO PREGNANCY

It is now acknowledged, both physiologically and clinically, that the thyroid gland normally hypersecretes during pregnancy. Freund in 1882, and Lange in 1893 and 1898, made methodical examinations of the state of the thyroid gland of a number of pregnant women, and the result of their investigations was that a moderate degree of hypertrophy was the rule. Lange examined 133 pregnant women in the last three months of pregnancy and found that there was an hypertrophy of the thyroid in 108. He observed that in the 25 cases without hypertrophy, they had more tendency to albuminuria. In one case, in her first pregnancy, she had albuminuria and no hypertrophy of the thyroid; while in her second pregnancy, there was a large thyroid and no albuminuria. Lange points out that it is in the later months of pregnancy that serious albuminuria is prone to develop, and that it is also in the later months that the apparently beneficent hypertrophy of the thyroid normally occurs. Lange also made extensive experiments on animals, and his conclusions were confirmed, that the hypertrophy of the thyroid in the course of pregnancy is a normal process.

Nicholson found the thyroid hypertrophied in eighty-one per cent of his cases. Klein has also discovered that the normal gravidic hypertrophy of the thyroid does not occur when the kidney of pregnancy develops, and Lobenstein states that in a series of fifty eclamptics, no hypertrophy was present except in two cases.

After Lange's work, numerous authors have attempted to explain this hypertrophy as due to the increased function of the gland during

pregnancy, and various disorders incident to gestation have been ascribed to the perturbation of this function. As the metabolism of the body is greatly increased during the pregnant state, and as the function of the thyroid gland is closely related to the metabolic processes, it is reasonable to consider this hypertrophy of the gland as a normal accompaniment, in order to keep the system sufficiently supplied with iodothyrin by an increased functionating power of the gland.

There are two varieties of enlargement of the thyroid which occur as a normal accompaniment of pregnancy. (1) There is sometimes observed a sudden hypertrophy of the gland during accouchement which is followed by a complete recession, but also in some cases by a persistent and definite hypertrophy. An ingenious attempt to explain this phenomenon has been made by Guyon. He states that due to the violent and prolonged effort of labor there is arrest of the circulation at the level of the temporal artery, while the radial pulse persists. One of the factors in this arrest of circulation is the compression of the carotids by the lobes of the hypertrophied thyroid, which becomes markedly turgescent, due to the difficulty that the superior vena cava has in emptying itself, owing to the violent straining and arrest of the movements of respiration during a labor pain. Guyon suggests that this may be a physiological function of the thyroid by which excessive congestion of the cerebral veins and cranial sinuses is prevented,— the arterial supply being cut off by the sudden enlargement of the lobes of the thyroid. (2) The usual hypertrophy of the thyroid occurs gradually after the fourth or fifth month, and after the accouchement it returns to the normal, or nearly so. This enlargement is dependent upon the increased functional activity of the gland, made necessary by the double metabolism of the mother and child.

Occasionally pregnancy exerts a pathological influence upon the gland. Bignami has reported a case in which there was a considerable hypertrophy during the first pregnancy, but which returned to normal after the delivery. In her second pregnancy the enlargement was so great as to cause her death by asphyxia. Cases in which the enlargement of the thyroid in pregnancy was such as to make an operation necessary have been reported by Ahlfeld, Albers-Schönberg, and Meinert.

GRAVES' DISEASE

For a proper understanding of the present status of the results of research work on Graves' disease, it will be necessary to review some of the work of the investigators in detail. At the outset it must be appreciated that Graves' disease presents a great variety of clinical pictures, so that the text-book description of a typical case gives no idea of the many phases in which the disease may present itself. This variation in type is understood when we realize that the symptom complex is dependent upon the pathological changes in the structure of the thyroid gland. These pathological changes are often of a progressive nature, shown clinically by successive stages from a typical Graves' disease, through a mixed indefinite type, to a condition of myxedema.

Ewing describes four distinct stages in the natural history of the gland of Graves' disease, as follows:

1. In the early stages of the disorder, there are only hyperæmia, with increase of colloid, showing diminished staining reaction with eosin. Macroscopically, the gland shows no gross changes.

2. Hyperæmia, with increased colloid and cellular hyperplasia.

3. Extensive cellular hyperplasia, with increase of imperfect alveoli lined by large or giant cells, and nearly complete loss of colloid.

4. Late stages with fibrosis, atrophy of cells, sclerosis of vessels, hæmorrhages, and cysts.

It is due to the great variations of the symptoms in the different stages of this disease, which symptoms indicate variations in the function of the gland dependent upon the pathological changes existing at the time, that such contradictory results are obtained by the indiscriminate treatment of the disease with the various extracts or preparations of the thyroid gland that are obtained commercially. As Rogers and Beebe point out, it must be obvious that it is not to be expected that any one treatment, however effective it may be in one stage, can be equally applicable to all stages of the disease.

THEORIES AS TO ETIOLOGY

There have been advanced two theories as to the manner in which Graves' disease is caused, both of which have been made the basis for a cure of the disease by serum therapy. The majority of the efforts have been based upon the assumption that the chief function of the thyroid secretion is to neutralize a toxin which arises in the course of metabolism.

Oswald has shown that the physiologically active portion of the gland is the proteid thyreoglobulin. Thyreoglobulin contains a small amount of iodine, which has been isolated as iodothyrin (an organic iodine compound) by Baumann. The existence of the toxin of metabolism with which the thyreoglobulin is supposed to combine and thus neutralize, has not as yet been proved.

In accordance with the above hypothesis, Ballet and Enriquez used the serum from a case of myxedema on one of exophthalmic goiter. Likewise Burghardt and Blumenthal have used the serum of thyroidectomized dogs upon cases of Graves' disease, and Moebius has prepared milk of thyroidectomized goats for use in this disease on the same theory. The results of the treatment bearing on the above hypothesis have not been as favorable as was hoped for.

The second theory as to the etiology of Graves' disease is based upon the proved fact that normal thyroid secretion is toxic, and that the symptoms of the disease are produced by an excessive secretion of the thyroid, or an overdose of the normal product of the gland. This is known as the hypersecretion theory. It does not attempt to explain the physiological function of the secretion, but recognizes in its toxic properties a direct cause in the production of the characteristic symptoms of Graves' disease. At present it is not known whether the secretion of the gland of Graves' disease is more or less toxic than the normal gland. As it is not possible, so far, to stimulate the thyroid to over-activity and to thus produce the disease, the evidence that Graves' disease is essentially a peculiar toxæmia, due to overproduction of the gland, is as yet circumstantial.

The very thorough investigations made by Oswald of the chemistry of the normal thyroid and of the gland of Graves' disease, show little or no material difference in their secretion, the only demonstrable difference being a lower proportion of iodine in the diseased gland, although this was not constant. These investigations tend to bear out the theory of hypersecretion.

The work of Rogers and Beebe has been based upon this theory. Beebe summarizes the arguments in favor of the hyperactivity of the thyroid as the main factor in the production of Graves' disease, as follows:

"1. Feeding thyroid gland produces symptoms and metabolic changes quite similar to those of Basedow's disease.

"2. The gland, in the vast majority of cases, is enlarged and hyperæmic.

"3. Removal of a portion of the gland, will, in many cases, effect a cure.

"4. Recurrence after operation is in most cases accompanied by a recurrence of the tumor.

"5. The histology of the gland shows that active processes are taking place. Because of the large relative increase in the number of cells, we find chemically a much larger amount of nucleoproteid in the diseased gland.

"6. Chemical study has thus far failed to find a special toxin in the Graves' gland. The physiological action of the diseased secretion is due to compounds which are quite analogous, if not identical, with those in the normal gland."

The fact that the therapeutic results obtained by Rogers and Beebe from a cytotoxic serum[1] prepared from both normal human glands and from Graves' glands are similar, bears out the above contention that Graves' disease is due to an excess of the thyroid secretion, and not to the presence of a special toxin in the pathological gland.

The action of their specific cytotoxic serum is based upon the theory of hyperactivity of the

[1] Rogers and Beebe describe the making of this cytotoxic serum as follows: "The serum must be made from human thyroid glands because of the biologic specificity of proteids. The fresh human glands must not be preserved in formalin or alcohol. They are first ground to a fine pulp and extracted in several times their volume of salt solution, made faintly alkaline with sodium hydroxid.

Extraction is carried on in a refrigerator for 24 to 36 hours, and chloroform added to prevent bacterial growth. This is then filtered. The proteids are then precipitated from this extract and purified. The purified product is dissolved in alkaline salt solution and inoculated into the peritoneal cavity of the rabbit or sheep to develop the serum. From five to eight inoculations, one week apart, are given to each animal before the blood is withdrawn and the serum prepared by the usual method.

thyroid gland in Graves' disease, and is designed to neutralize the toxic effects of the thyroidproteid which is in excess in the circulation, and also to inhibit the secretory activities of the gland.

From what has been said before as to the great variations in the clinical manifestations of the disease, depending upon the histological condition of the diseased gland, it is obvious that the cytotoxic serum would not have a curative action except in the cases of comparatively recent development where we have the excess of thyroid secretion to combat, and not in older cases in which secondary changes have occurred and which have symptoms of a myxedematoid character. The same restriction would, of course, apply equally to the operative treatment of the disease.

The cases suitable for the cytotoxic serum must therefore be carefully chosen, and cases of the disease that are atypical, presenting signs of thyroidism and of myxedema, may require a combined treatment of thyroid preparations and the anti-serum.

Those cases of Graves' disease or other diseases, as myxedema, which are dependent upon a deficiency in the quantity or quality of the thyroid secretion,— being a condition of *hypo*-thyroidism, require *pro*thyroid medication, in contradistinction to the cases showing evidences of *hyper*thyroidism,— which condition calls for the *anti*-thyroid treatment. Where prothyroid treatment is indicated, Rogers and Beebe prefer to use the hypodermic method of administration, as in the physiological process the thyroid secretion enters the circulation without the intervention of digestion. They have used for this purpose a saline extract made by pulverizing fresh normal human thyroid glands and extracting the hashed mass for from three to five days in five volumes of physiological salt solution, with the addition of a little chloroform to prevent bacterial growth. The extract is filtered first through paper, and finally through a Berkefeld candle, and sealed in small glass tubes. This extract represents the nucleoproteid and the thyreoglobulin of the normal human gland, which, according to Oswald's researches, contains the active principle. These two proteids they have been able to separately imperfectly, but Oswald maintains that they are identical proteids. Both contain iodin, and both are physiologically active.

The physiological activity of the proteid is probably dependent upon the contained iodin, and no difference in the therapeutic results has been noticed in their separate administration when made from normal thyroid glands. If made from pathological glands, there may be a considerable difference in the therapeutic effect of the two sorts of proteids. Clinical experience has shown that more prompt and certain action is obtainable by the hypodermic administration of the proteids than when given by the mouth.

The results obtained by Rogers and Beebe with their saline extract of nucleoproteid and globulin for prothyroid medication, and with their cytotoxic or anti-serum for anti-thyroid treatment, have been, in the main, very satisfactory, especially in the type of cases which present symptoms of typical exophthalmic goiter in the earlier stages, whether mild or severe.

THE RELATION OF GRAVES' DISEASE TO PREGNANCY

A study of the relation between Graves' disease and pregnancy, and also the puerperium, was made by Theilhaber in 1895. He found that the majority of coincident cases of pregnancy and Graves' disease were made worse by the disease, and that a minority were improved by it. Kleinwächter claimed that the atrophy of the uterus, ovaries, and breasts, which was not infrequently observed in cases of Graves' disease, made pregnancy impossible, but Theilhaber saw a patient who became pregnant after several years of such atrophy. Theilhaber states that pregnancy favors the development of Graves' disease, and will usually increase an already existing case. He believes that the increase of the symptoms of thyroidism is due to the nervous instability incident to pregnancy. Hirst also states that Graves' disease is unfavorably influenced by pregnancy and that it may have its origin in gestation. He says it predisposes these patients to uterine hæmorrhages and that it may be the cause of fœtal death. It is likely to be complicated by albuminuria. He has one

patient in whom exophthalmic goiter with all its classical symptoms has recurred regularly in three successive pregnancies, the woman at other times being quite free from the disease.

A goiter may take on so exaggerated a development during pregnancy that asphyxia is threatened and tracheotomy is necessary. Two such cases are reported in Müller's clinic in Berne, which required operation to relieve the asphyxia.

Whitridge Williams considers that pregnancy exerts a deleterious influence upon Graves' disease. In several cases he has found the tachycardia was greatly increased, and was lessened after the labor. While the majority of Graves' patients are made worse by pregnancy, still a number of cases of decided improvement of the symptoms throughout the gestation have been observed. According to most writers, the cases which are improved are those in which the Graves' disease is of the early type. In this type of the disease there is an excessive thyroid secretion of a probably normal character, as the secretion of a changed or poor quality is found in the later stages of Graves' disease when there are marked histological changes present in the gland.

This improvement of Graves' cases by pregnancy may be accounted for by the increased metabolism made necessary by the growing fœtus, requiring an increased amount of thyroid secretion, and thus the excess secretion resulting from the Graves' disease is utilized and less of it remains in excess to produce the characteristic symptoms of hyperthyroidism. Likewise, when the labor is terminated in these cases, we find that the symptoms of hyperthyroidism at once return or are increased in severity.

As an illustration of this condition, I report the following case occurring in my practice:

CASE 1. Mrs. L. H. was referred to me by Dr. Rogers on November 9, 1908. The patient was 26 years old and was pregnant for the second time. Her first pregnancy was three years ago and was perfectly normal. The date of her expected labor was about January 10, 1909. She had been under treatment by Dr. Rogers about one and a half years previous to this pregnancy for typical Graves' disease of the early type. She had always been in good health until she developed exophthalmic goiter about two years ago. She received marked benefit from the treatment with the anti-serum, and she told me she considered herself cured. However, she still presented a marked condition of exophthalmos and the hypertrophy of the thyroid was greater than the normal hypertrophy usually observed in pregnancy. Her pulse rate ranged from 80 to 90, and there was a decided nervousness of manner. Asking her how she felt better of her Graves' symptoms, she said that she was not so easily tired, could sleep better, had less digestive disturbances, and had no more tachycardia, which had previously distressed her greatly. She stated that since she had been pregnant there had been no increase of her previous symptoms, but on the contrary she felt better in every way. Her urine showed a trace of albumin but no casts; the specific gravity was 1018 to 1022, and the total quantity was normal. Dr. Rogers told me that she was not cured, but that he placed her in the improved class, as it was difficult to get her to continue her treatment for a sufficient time after she began to feel better. Her labor began on January 5, 1909, and the pains were normal in frequency and strength throughout. Her pulse was 82 at the outset, and was 88 at the termination of the labor, which lasted 12 hours and was normal in every way. From the labor to the third day of the puerperium the pulse rate varied between 72 and 80, and the temperature between 97.8 to 98.2, but on the fourth day her pulse increased to 104, and continued to vary between that rate and 120 until she was referred back to Dr. Rogers at the end of a month. The highest temperature during the puerperium was 99.2. Coincident with the increased pulse rate, she became decidedly more nervous, suffered from sweats, itching of the skin, and occasional diarrhœa. With the development of the symptoms of hyperthyroidism, the baby began to have five to eight watery stools a day, which could not be controlled by colon irrigation or other means. It is possible that this looseness of the bowels may have been dependent upon the condition of the mother.

THE RELATION OF THE THYROID GLAND TO THE TOXÆMIA OF PREGNANCY

The present status of our knowledge relating to the toxæmia of pregnancy is too well known through the recent writings of Williams, Ewing, Stone, Edgar, and Strauss in this country, and Bouchard, Saint Blaise, Pinard, Veit, and others, to make it necessary to give more than a summary of the subject at this time.

There is no longer any doubt of the existence of the state which we now speak of as the toxæmia of pregnancy. However, whether all toxic diseases and manifestations in pregnancy are all one and the same process, varying only in degree from nausea and headache to eclampsia and acute yellow atrophy, will be a debatable subject for a long time to come. Williams believes they are separate and distinct diseases,

while Ewing and others are of the opinion that they are all various degrees of a manifestation of hepatic insufficiency.

Ewing believes that most of the special morbidity of pregnancy is due to a basic autotoxic state, and thus includes nausea, headaches, salivation, constipation, skin manifestations, neuritis, etc., as well as the more severe conditions of hyperemesis, pernicious vomiting, eclampsia, and acute yellow atrophy. Ewing has always been able to demonstrate lesions of the liver in cases with a fatal ending after pernicious vomiting. He also states that whenever there are symptoms during life of hepatic insufficiency, the urine will show signs of perverted metabolism, and at autopsy some lesions of the liver will be found.

Edgar gives a definition of the toxæmia of pregnancy "as a state of the blood and metabolism arising from the hepatic insufficiency to which the pregnant woman is strongly predisposed; expressed most commonly by trivial ailments (petty morbidity of pregnancy) but exceptionally by serious, severe, and even pernicious vomiting, eclampsia,—conditions which, while once thought to have nothing in common, are now seen to be closely related."

The studies of Hageman, Ver Ecke, and Jageröos in metabolism, have shown that katabolic processes are most prominent in the first half of pregnancy, as is indicated by the fact that more material is excreted than ingested during this period, whereas the reverse obtains in the second half of pregnancy, when there is a marked tendency toward the storage of various food products. There is then a considerable storage of nitrogen, as the maternal organism preserves the strictest economy in its metabolic processes, its purpose being to facilitate the growth of the fœtus. The excretory functions are more liable to derangement at this time, as they have to dispose of fœtal as well as maternal eliminations, and when this occurs the woman must suffer from the retention of certain products of metabolism.

There must be an accumulation of toxic substance in the blood if the liver fails to synthetize the lower nitrogenous products of katabolism to urea. When there are changes in the alkalescence of the blood, we have the "acid intoxication" which probably is indicative of imperfect oxidation of the fats, and is due to acetone bodies and lactic and fatty acids.

Edgar classes the hyperemesis of pregnancy and eclampsia as "subacute toxæmia." He believes that a large proportion of the cases of vomiting of pregnancy are due to hepatic insufficiency with resultant toxæmia, although he is not convinced that all cases are autotoxic. We must recognize that cases of hyperemesis may be dependent upon neurotic causes. In these cases the differential diagnosis must be made by a careful examination of the urine for the evidences of perturbed metabolism. Williams pointed out that, when due to toxic causes, there is a much greater proportion of the total nitrogen excreted in the form of ammonia than normal.

Edgar says that eclampsia may be regarded as a complicated condition of severe toxæmia, due to hepatic insufficiency plus renal inadequacy, dependent upon the toxic substances in the blood being sufficient to cause destructive kidney lesions.

In order to be able to diagnose the extent of a toxæmia of pregnancy, we must study the state of the metabolism as shown by the complicated analysis of the urine for the nitrogen partition. The percentages of the total nitrogen excreted in the form of urea nitrogen, ammonia nitrogen, purin nitrogen, kreatin nitrogen, and the rest nitrogen must be determined.

A toxic state is indicated by a marked diminution in the total nitrogen, and also by a high percentage of ammonia or undetermined nitrogen. Williams states that normally in the first half of pregnancy the ammonia coefficient varies from four to five per cent, while in toxic vomiting it may rise to 10, 20, 30, or 40 per cent, and in one case (death) it reached 48 per cent. While the increase in the percentage of ammonia nitrogen is not pathognomonic of toxæmia, it certainly is suspicious, especially if it reaches as high as 10 per cent.[1]

Abt, in a study of this subject made in 1904, shows that there is considerable evidence which indicates that the failure of physiological

[1] It is well to note that Folin states that 10 per cent ammonia nitrogen may be normal, a pronounced reduction in the total nitrogen being always accompanied by a relative increase in the ammonia nitrogen. Ewing and Wolf also point this out.

hypertrophy of the thyroid gland during gestation is productive of a pathological state, and thus may be the cause of certain disorders. That these disorders are especially of a convulsive nature, not dissimilar to attacks of eclampsia and the crises of tetany.

In view of the above, a case reported by Heile, of the removal of a goiter in a woman 45 years of age, in the ninth month of pregnancy, is of interest. Two parathyroids, of the size of the eye of a chicken, were left in situ. In spite of this precaution, convulsions occurred seven days after the operation. Labor began prematurely and the convulsions ceased for eight days, then reappeared, but the loss of consciousness which was so frequent before the labor (every two hours) only occurred twice in seven consecutive weeks. The amelioration of the symptoms was accompanied by an abundant diuresis, nine liters in twenty-four hours, with no evidence of albumin or kidney lesion. As the parathyroids were not all removed in this case, it would appear as though the eclamptic seizures were dependent upon the sudden deficiency of the thyroid secretion induced by the operative removal of the gland, especially as before the operation there were no evidences of a pre-eclamptic condition or kidney lesion.

Again, Hergott reports a case with myxedema, which was delivered in his service, with attacks of eclampsia. The patient was 18 years old, but had the aspect and stature of a child of 11 years, with the characteristic face. There was no appreciable thyroid gland, and the intelligence was but tolerably developed. On admission to the maternity ward there were no signs of albuminuria or the pre-eclamptic state. The labor was spontaneous, but its progress was slow. After being in labor for two days, she had an eclamptic seizure which was not very intense, but she had the characteristic convulsions of the muscles of the eyes and face. One hour later she had a more severe attack, and then one each hour, the attacks being characteristic of those of an ordinary eclampsia. The child was born naturally, but died soon afterward. She then had eight seizures in the next 24 hours. The urine was examined repeatedly, both before and after the labor. There was no albuminuria in the first or last analysis, and but traces in two intermediate examinations. The patient never complained of headache or trouble with the vision.

As the condition of myxedema was dependent upon a deficient thyroid secretion, this case also presents evidence in favor of the theory that the absence of the necessary secretion was an etiological factor in the production of the eclampsia.

Another observation reported by Verstraeten and Vanderhuden has an important bearing upon this hypothesis. In 1892 they removed the thyroid gland from a cat. The animal lost weight, and the skin became dry and scaly, the hair harsh, and there was general listlessness. In 1895, the animal, which was believed to be sterile, became pregnant. As the pregnancy progressed, the cat refused nourishment, and finally became comatose and developed convulsions, which condition lasted for 5 days. The labor came on with slow and poor contractions. The authors then injected under the skin 6 cc. of macerated and triturated sheep's thyroid. One hour afterward the animal was decidedly improved. This improvement continued and the convulsions ceased. Later, a dead fœtus was born and the cat made a permanent recovery. The authors close with this statement: "We are not sure that in all cases of puerperal eclampsia it is due to hypothyroidism, but we believe firmly that in certain cases this cause exists."

Nicholson, as well as Lange, was among the first to advance the idea that the failure of the thyroid gland to hypertrophy during gestation was the cause of eclampsia and other toxæmias of pregnancy. He argues that eclampsia occurs as a result of some failure in the process of proteid metabolism, and that this failure to deal efficiently with nitrogenous products is due either to a deficiency of the iodothyrin, or to the impaired activity of the secretion. He believes that the thyroid secretion is an essential factor in the adequate function of those organs which preside over the metabolism of proteid substances, and that if it is insufficient the final product, urea, is not manufactured and a toxic state is the result. Nicholson therefore used thyroid extract in cases of eclampsia, with the idea of supplying this deficiency.

Lobenstein has also used thyroid extract in 11 cases of eclampsia, and believes it of value in some instances. He found, as did Nicholson, that the administration of thyroid extracts in eclampsia undoubtedly lowers the pulse tension, and favors marked diuresis and diaphoresis. It is necessary to use large doses in order to produce thyroidism rapidly. He used 30 grains, per rectum, repeated in 6 hours.

In addition to the foregoing, Lange and Nicholson both think that the thyroid extract may be a specific for the disease, and that by favoring metabolism it is able to counteract the effect of the toxic material in the blood.

Sturmer has had quite an extensive experience with thyroid medication in eclampsia, and McNab, Baldowsky, and Vassale have also reported its use.

Collin Foulkrod reports a case of a primipara which gave evidences of a toxæmia dependent upon a deficiency in the thyroid secretion. The patient became profoundly anæmic, had anorexia, insomnia, and marked digestive disturbances. The urine gave no evidence of nephritis. The thyroid presented no enlargement. The usual medication was without benefit. Five grains of thyroid extract, given four times a day, at once produced a marked amelioration of the symptoms and an increase in the quantity of urine.

He reports another case of a multipara which was careless of the condition of the bowels and of her general hygiene. She presented a case of indiscriminate eating of proteids, with poor elimination. The thyroid gland was much larger than it is usual to find during pregnancy. She developed headaches and diminution of urine, and albuminuria. The thyroid extract was given, and at once the thyroid gland became very tense and pulsating, with an increase in all her symptoms. The withdrawal of the thyroid treatment, ice bags to the neck, etc., resulted in marked relief, and the patient gradually made a recovery. In this case there was, in addition to the failure of the emunctories, an increased thyroid secretion present, and giving more thyroid secretion in the form of the extract but added to the trouble. It would appear as though an anti-serum would have been indicated in this case, in addition to eliminative treatment.

THE RELATION OF GRAVES' DISEASE TO THE TOXÆMIA OF PREGNANCY

We must recognize that the whole subject of metabolism is a very complex one, and that our present knowledge regarding it is but embryonic. Further researches will undoubtedly alter many views now held as probable, but that the liver is largely concerned in this function is likely to remain true, although undoubtedly other organs,— as the muscles, intestines, kidneys, blood, etc., play their part.

It may be accepted as demonstrated that the thyroid gland exercises an important bearing upon this function. Thyroid feeding undoubtedly promotes increased nitrogenous metabolism, as shown by the increased nitrogen output in the urine. A failure on the part of the thyroid to supply a sufficient and a normal secretion must therefore profoundly affect the proper conversion of nitrogenous substances to anabolic or katabolic purposes, and to ultimate waste products.

We have seen that the toxæmia of pregnancy is probably dependent in a great measure in a failure in metabolic processes, and whether the changes found in the liver are the primary cause of the toxæmia, or whether they are the result of some perversion of metabolism in other organs, the disturbance of this function of the liver adds greatly to the seriousness of the condition.

In view of the relation of the thyroid gland to nitrogenous metabolism, it would seem reasonable to believe that it may have an important etiological influence upon the toxæmia of pregnancy. When we remember the importance of the liver in the function of metabolism, and that the toxæmia of pregnancy is associated with insufficiency of this function, that Ewing and others have found changes in the liver as constant in toxic vomiting of pregnancy, and that a deficiency or an alteration in the thyroid secretion profoundly disturbs metabolism, there would seem to be good ground for this belief.

If the above theory is true, any disease which involves the thyroid gland, such as Graves' disease, would, by altering the secretion of the gland and thus materially affecting metabolic processes, have an important influence on the toxæmia of pregnancy, if it is not the

main etiological factor in producing the toxic state.

We know that Graves' patients who become pregnant are prone to various disorders. The majority of the cases do not stand pregnancy well. The minority, which improve during gestation, are those cases which are in the earlier stages of the disease, where the secretion is not materially altered in quality, but is in excess, as illustrated by case 1 which I report, or as in those cases, reported by Rogers and Beebe, which had the benefit of anti-serum injections throughout the pregnancy. They report five cases which, while in the improved class, have gone through a normal pregnancy with delivery at term of four healthy children. Three of the five cases were treated throughout with their cytotoxic serum. In another case which came under Rogers' observation, one-half the thyroid had been removed for Graves' symptoms, with decided benefit. The patient became pregnant, but did badly, having toxic vomiting, and died suddenly in the fourth month.

Graves' disease implies faulty thyroid secretion. Rogers classifies the variations in the secretion in the gland as follows:

The proteid thyreoglobulin may be in diminished quantity and fairly normal quality. This is the condition in the incipient stages of thyroidism.

It may be in excessive quantity and of normal quality, as in early typical period of thyroidism.

It may be in excessive quantity and very poor quality, as in cases approaching the myxedematoid type,— cases which may have existed for several years, etc.

It would appear reasonable, then, that if a case of Graves' disease was pregnant and developed evidences of faulty metabolism, as shown by clinical signs of toxæmia of pregnancy, and by the more exact status of the metabolism as demonstrated by the nitrogen partition, the proper therapy would be to correct the faulty secretion of the thyroid by inhibiting it, if in excess, by an anti-serum, and by supplying its deficiency, if impotent, with proteidthyroid substance.

The work of Nicholson and others has been based on the latter part of this hypothesis, but in reference to eclampsia especially.

Eclampsia is a complicated form of toxæmia, as the toxic state of the blood usually produces secondary degenerative changes in the kidneys, which may in themselves be sufficient to cause a fatal termination. Therefore, we would expect that the results obtained by the use of thyroid substances would be uncertain in these cases, as much would depend upon the condition of the eliminating organs.

It is well to note in this connection that we have evidence that thyroid feeding decidedly increases the urinary excretion, and that by aiding metabolism it tends to correct the disproportion in the relation of the nitrogen products, rendering their proportion more nearly normal.

In the form of toxæmia of pregnancy, as hyperemesis, or even pernicious vomiting, where the kidneys may not show such marked degenerative changes as in eclampsia, theoretically we may look for more satisfactory results from the employment of thyroid therapy, especially in those cases where the thyroid gland is undoubtedly not functionating properly, as in Graves' disease.

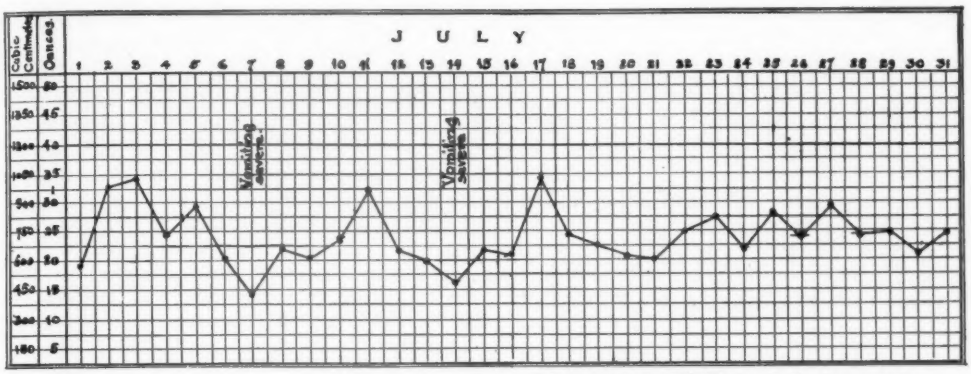
As an illustration of this type of toxæmia, I report the following case in my practice, which was kindly referred to me by Dr. Rogers:

CASE 2. Mrs. A. T., aged 32 years, primipara, was at the end of the third month of pregnancy, when I first saw her. She had been married for six years and had had two miscarriages, one five years and the other two and a half years ago. Both were in the third and fourth weeks, and were spontaneous. The family history showed that several (two or three) of her cousins on the maternal side had had Graves' disease. Her childhood presented nothing unusual. She was very athletic, being fond of outdoor sports, as riding, golf, tennis, etc. About twelve years ago she had an illness which was said to be nervous prostration, but which, in the view of later knowledge, was undoubtedly unrecognized Graves' disease. After several years she apparently recovered and when married was in fair health. About three years ago she had a return of the symptoms of Graves' disease, which became pronounced about a year later. There were all of the characteristic manifestations, except that the degree of exophthalmos was not marked. The tachycardia was very troublesome.

At this time she was a patient of Dr. Rogers, and she was treated by him with the specific cytotoxic serum and thyreoglobulin, developed by Beebe and himself, with decided benefit. Subsequently, as she was very desirous of children, and on account of the miscarriages she had had, she was curetted. About two weeks

CHART I DAILY TOTAL QUANTITY OF URINE

TOXEMIC VOMITING 5TH MONTH OF GESTATION



Minimum 13 ℥

Maximum 34 ℥

Average 23.1 ℥ (693 cc.)

No albumen
No sugar.

Injections of Proteid Thyreo-globulin M V twice daily (average)

after the operation she had a marked return of her Graves' symptoms. The serum treatment was continued until she was again greatly improved, when she became pregnant.

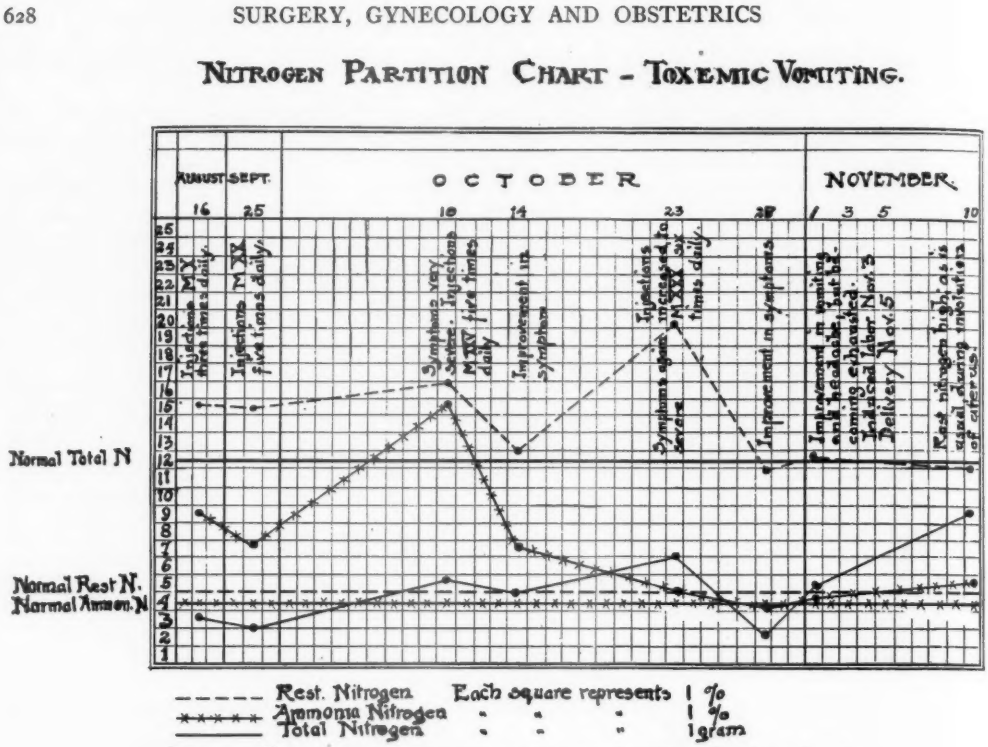
When she was referred to me she was just over her third month of gestation. According to Dr. Rogers, the condition of her thyroid secretion was that of an excess and of a very poor quality, such as is observed in cases which have extended over several years. She presented a decided appearance of nervousness with some restlessness. The thyroid showed a moderate hypertrophy, somewhat more than is normal during gestation. Her pulse rate was in the neighborhood of 100. She began with a morning sickness early in the second month, and was having considerable trouble with it at the time I first saw her. Her bowels were constipated. Her urine at this time presented nothing unusual.

As the vomiting began to be somewhat persistent, it was thought that it might be dependent upon the faulty thyroid secretion, and hypodermic injections of the proteid thyreoglobulin, in 5 minim doses, were given, to see if they would have any influence upon the emesis. These injections were of the saline extract of nucleoproteid and globulin, made from normal human thyroid glands, of the strength of 1 to 100, and were given with the idea of making up the deficiency of normal thyroid secretion, with the object of promoting nitrogenous metabolism, and also to increase the urinary output, in the hope that if the vomiting was of a toxic nature it would be relieved. The effect of the injections at this time appeared to be beneficial, but as the emesis was not as yet persistent, the injections were given only occasionally.

Throughout the fifth month the injections were given with regularity, 5 minims twice daily, and there seemed to be a decided control of the frequency of vomiting, for if the time of the injection was delayed, or if it was omitted, as occasionally happened, the emesis returned more promptly. From this time on to the termination of the pregnancy the case took on the aspect of serious toxic vomiting. The urine output became very much diminished, and an accurate record of the daily total quantity of urine excreted was kept from the beginning of the fifth month until the labor, as shown on the accompanying charts. Associated with the vomiting was a persistent headache, which became severe as the vomiting increased and the urine output was diminished. It will be seen by a reference to the urine chart that the total quantity of urine,— 24 hours,— varied throughout the fifth month from as low as 13 ounces (390 cc.) to a maximum of 34 ounces (1,020 cc.), the average being 23.1 ounces (693 cc.).

The amount of nitrogenous intake in the form of solids was, of course, limited, but a considerable quantity of fluids was taken. The bowels were kept open each day.

During the sixth month, on August 10th, a nitrogen partition of the urine was made. (See Nitrogen Partition Chart.) This analysis showed a marked diminution of the total nitrogen, also of the urea nitrogen, while the ammonia nitrogen, kreatinin, and rest nitrogen were increased,— the ammonia nitrogen being nearly 9 per cent instead of 4.5 per cent, and the rest



Note: There was no albumen and no sugar present in the urines.

nitrogen being over 15 per cent, instead of about 4 per cent. Accordingly the marked disturbance of nitrogenous metabolism present pointed to the cause of vomiting as toxic instead of neurotic. A reference to the urine charts will show that there was an entire absence of albumin or sugar throughout.

At this time, during the first two weeks of the sixth month, the dose of thyreoglobulin was increased to 10 minims twice daily, and then for the next two weeks to 10 minims three times daily. This was made necessary by the increase in the frequency of the vomiting attacks, and the fact that the benefit derived from the injections did not last so long. There could be no doubt that decided relief was obtained from both the vomiting and headache by the administration of the thyroid proteid. It acted almost as a specific. The patient herself was most positive of this, as was also the husband (who was a most careful observer), and the nurse.

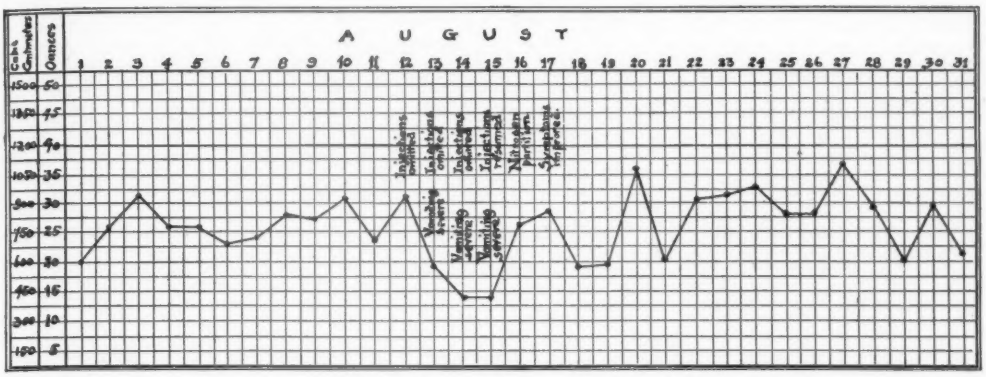
In addition, there could be no doubt that the injections had a decided influence on the total quantity of urine excreted. A reference to the chart will show that during the sixth month the total quantity from August 1st to the 12th varied from 20 ounces (600 cc.) to 33 ounces (990 cc.). On August 12th it was 28.75 ounces (862.5 cc.) and on this day and the two days following, the injections were discontinued with the idea of seeing what the effect would be upon the amount of urine excreted, and the symptoms. It will be seen that the urine fell to 19.5 ounces (585 cc.) on the 13th, and to 14 ounces (420 cc.) on the 14th, and to the same amount on the 15th. Coincident with the diminution in urine, the vomiting and headache were also markedly increased, so much so that both patient and husband protested against any further experiments. On the 15th the injections were renewed, with a prompt increase of the urine, as shown by the chart, and an improvement in the symptoms.

During the seventh month of the pregnancy the daily average of urine was 24.75 ounces (742. 5 cc.), the minimum being 13.5 ounces (405 cc.), and the maximum 41 ounces (1,230 cc.). Throughout the month the symptoms were very varying at times. From the 17th to the 27th of September the urine output was very low, averaging only 17.35 ounces (520.5 cc.) for the ten days. The nausea and vomiting were most distressing, the patient having attacks lasting two or three hours at a time, without relief, and as many as five or six in the 24 hours. The headache was also very severe. Itching of the skin was at times very troublesome.

A nitrogen partition was made on September 25th, and showed 3.29 grams of total nitrogen and nearly

CHART II DAILY TOTAL QUANTITY OF URINE

TOXEMIC VOMITING 6TH MONTH OF GESTATION

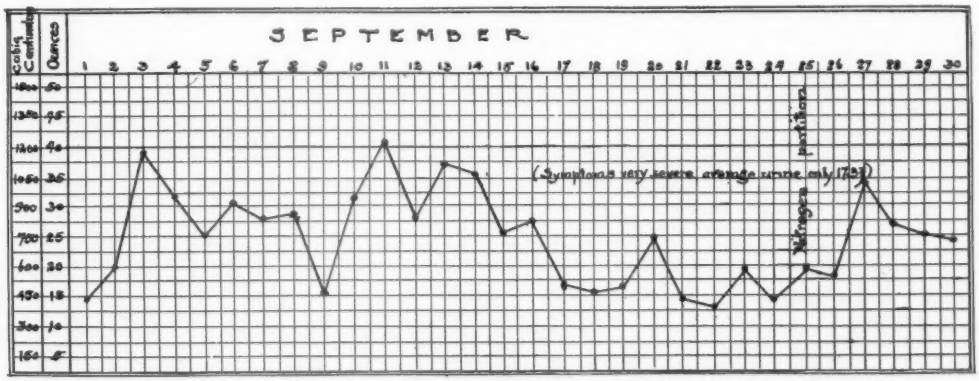


Minimum 14 ℥
Maximum 36 ℥
Average 25.85 ℥ (775 cc)
No albumen
No sugar

Injections of the proteid thyreo-globulin from the 1st to 12th were M X twice daily and from 18th to 31st M X three times daily.

CHART III DAILY TOTAL QUANTITY OF URINE

TOXEMIC VOMITING 7TH MONTH OF GESTATION

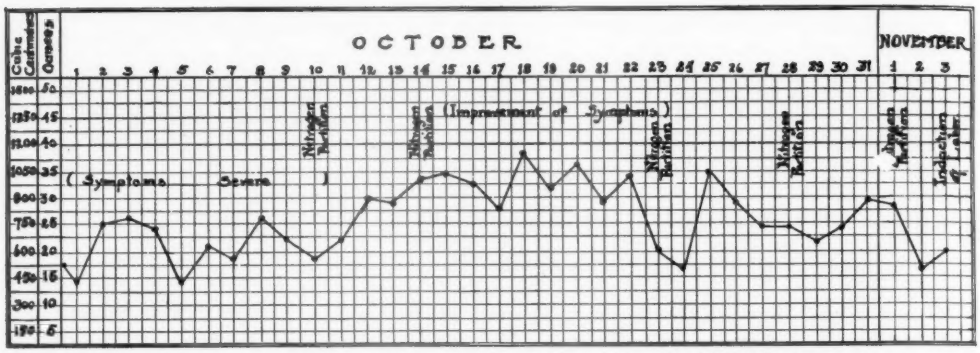


Minimum 13.5 ℥
Maximum 41.0 ℥
Average 24.75 ℥ (742.5 cc)
No albumen.
No sugar.

Injections of proteid thyreo-globulin increased to M XX five times daily during last two weeks.

CHART IV DAILY TOTAL QUANTITY OF URINE

TOXEMIC VOMITING 8TH MONTH OF GESTATION



Maximum 38½
Minimum 14½
Average 26.16½ (784.8cc)
No Albumen
No Sugar.

Injections of Proteid thyreo-globulin 1st to 23rd, M XXV five times daily; from 23rd to termination of pregnancy M XXX, five and six times daily.

7 per cent of ammonia nitrogen, and about 15 per cent of rest nitrogen. At this time the condition of the patient was precarious. She became so exhausted from the distress caused by her symptoms and the lack of nourishment that the question of interrupting the pregnancy was considered. As the patient was exceedingly anxious for children, and as she began to improve somewhat, the endeavor to keep her along until the end of the eighth month was persisted in. The injections were increased during the month to 20 and 25 minims five times daily. The amount required was regulated according to the quantity necessary to produce relief from the symptoms.

During the first ten days of the eighth month the evidences of the toxæmia were severe, and the injections were increased to 25 minims five times daily.

The daily average of urine for this month was 26.16 ounces (784.8 cc.) the minimum being 14 ounces (420 cc.), and the maximum 30 ounces (1140 cc.).

A nitrogen partition on October 10th showed total nitrogen 5.68 grams, ammonia nitrogen over 15 per cent, and the rest nitrogen 16.5 per cent. An improvement in the total quantity followed for the next 13 days,— the ammonia nitrogen dropping to 7 per cent and the rest nitrogen to 12 per cent, on October 14th, with a partial cessation of symptoms. On October 23d, the ammonia was about 4 per cent, or normal, although the rest nitrogen was very high at 20 per cent. The injections were increased again at this time, and continued until the labor, to 30 minims five and six times daily, with a considerable improvement in symptoms and urine, as on October 28th, the ammonia was only 3 per cent, and the rest nitrogen 11.5 per cent.

The patient was evidently becoming near the limit of her strength, and although the next analysis on November 1st showed but 4 per cent ammonia and 12 per cent rest nitrogen, it was apparent that it was unwise to defer any longer. The vomiting and headaches were troublesome, although much less than formerly, the patient was becoming prostrated, and she was within four weeks of term. She had lost about 15 pounds in weight during her gestation.

Manual dilatation of the cervix was made on the afternoon of November 3d to three fingers. On November 4th, at 10 A. M., a No. 3 Tucker-Voorhees bag was inserted, which was followed with regular but feeble pains. The membrane ruptured spontaneously at 11 A. M.

At 3 P. M. on November 5th, the No. 3 bag having been expelled, a No. 4 was introduced. This came away at 5 P. M. The temperature at this time was 98.8 pulse 96, respiration 20. As the patient had been 33 hours in labor since the introduction of the first bag, and the pains were totally inadequate, an operative delivery was plainly indicated. The pelvic measurements were ample, but the cervix, although it had admitted of the passage of the No. 4 bag, was still rigid and unyielding. A further effort was made to overcome this manually, before the forceps were applied at 6:45 P. M. The position was L. O. A. Repeated tractions of moderate force were made, but it was evident that the head, which was of fair size considering the length of the gestation, was prevented from advancing by the still rigid ring of the cervix. Dr. Dorman, who assisted me, also made several attempts at traction, and it was agreed that any further force exerted would certainly endanger the child. A version was, of course, out of the question, owing to the condition of the cervix.

It seemed that the case presented excellent indications for a so-called "vaginal Cæsareian section," or more properly a "vaginal hysterotomy," as the best chance of insuring a rapid delivery without more trauma to the child. Accordingly I separated the anterior vagina from the cervix, dissected the bladder from the anterior surface of the lower uterine segment, and with scissors cut through the anterior wall of the lower segment of the uterus in the middle line, sufficiently high to sever the unyielding ring. There was only moderate hæmorrhage, and the operation was not difficult, although I had only the nurse beside Dr. Dorman to assist me. As soon as the cervix was severed, the head came through with easy traction, the usual version not being necessary, and the child was born at 7:45 P. M. one hour from the application of the forceps.

The child weighed six pounds and had feeble primary respirations, and appeared at about the eighth month of development. The placenta was adherent, and had to be extracted manually. The uterus was sutured with chromic gut, and the vagina was reattached to the cervix. As there was a tendency to post-partum hæmorrhage, the uterus was packed with gauze.

The patient had a very rapid pulse throughout the operation, reaching 160 the night after the labor. The pulse continued in the neighborhood of 124 to 128 for the first four days, then dropped to 112, and continued to fall throughout the convalescence. The highest temperature was 101.4° which was on the second day. It was normal on the fifth day. All vomiting and headache ceased with the birth of the child, and while the pulse was rapid the general condition of the patient was excellent from the beginning of the puerperium, and she made a rapid recovery. The urine gradually increased in quantity to the normal amount in about two weeks. A nitrogen partition made on November 10th, five days after the labor, showed an increase in the total nitrogen to 8.4 grams, while the rest nitrogen remained high, as is usual during the involution of the uterus right after labor.

The child lived but about 36 hours, and an autopsy showed intracranial hæmorrhage. An earlier resort to the section of the uterus would have undoubtedly been advisable, in view of the above, yet the traction made with the forceps seemed at the time to be within the margin of safety.

One cannot review this case without being impressed with the fact that it would have been utterly impossible to have prolonged the pregnancy to the end of the eight month if it had not been for the hypodermic administration of the thyreoglobulin. In addition to the voluntary omission of the injections for three days in the sixth month, which was followed by a prompt and decided diminution in the quantity of the urine and an increase in the symptoms, there were several occasions during the long period of the administration when injections were delayed owing to various circumstances, as failure in the delivery of the extract from the laboratory, etc., which were sufficient to show that the patient had an immediate increase in her sufferings, which were promptly relieved when the delayed injection was given.

Whether the action of the thyreoglobulin was as a specific, antagonizing the special toxin causing the hyperemesis, whatever that might be, or whether the beneficial result obtained was by reason of its improving the oxidation of nitrogenous substances by aiding the metabolic processes, may be debatable, but it would appear that the latter hypothesis is the most reasonable when the important relation that the thyroid gland bears to metabolism is remembered. It would hardly appear that the diuretic action of the thyreoglobulin was entirely responsible for the improvement in the symptoms, as the relief from the vomiting and headache following an injection seemed to me to be too prompt to be dependent upon the increased urinary excretion, which frequently did not show for some time afterward. Of course the effect of the administration of thyroid proteids will have to be studied in many more cases of a like nature before definite conclusions can be reached, but as Beebe has already seen four or five cases of toxæmia of pregnancy which were treated with the thyreoglobulin with beneficial results, the outlook is at least promising.

The saline extract of the thyreoglobulin used throughout the case was especially prepared every few days from fresh normal human thyroids at the Loomis Laboratory, under the supervision of Dr. Beebe. The urine analyses were also made at the same laboratory. Dr. Rogers frequently gave his valuable advice and supervision during the pregnancy.

CONCLUSIONS

1. The thyroid gland is, in all probability, concerned in promoting nitrogenous metabolism.

2. There is considerable evidence that the thyroid gland normally hypertrophies during pregnancy and plays an important part in the increased nitrogenous metabolic processes incident to that state.

3. It is very probable that the toxæmia of

pregnancy is largely dependent upon faulty metabolism, at least an insufficient metabolism is an accompaniment which greatly adds to the seriousness of the condition.

4. Failure of the thyroid gland to hypertrophy during pregnancy is probably followed by insufficient metabolism, and may result in the various forms of toxæmia of pregnancy.

5. Graves' disease, by materially altering the quantity and quality of the thyroid secretion, has an important influence upon metabolic processes, therefore if associated with pregnancy, owing to the increased metabolism incident to that state, it becomes a grave complication.

6. When there is a failure of the normal hypertrophy of the thyroid gland during pregnancy, and when there is a diseased thyroid, as in Graves' disease, the administration of thyroid substance, by supplying the deficiency of the normal thyroid secretion and by diuretic action, may materially improve a faulty metabolism, and thus have a favorable influence upon the manifestations of the toxæmia of pregnancy.

7. The use of a saline extract of thyroid proteids made from fresh normal human glands is much more efficient in rapidity and reliability of action than the sheep thyroids as ordinarily prepared, therefore much more satisfactory results may be expected from its use.

8. The hypodermic administration of thyroid proteids is greatly superior to oral administration, especially when used in cases of toxic vomiting of pregnancy, or in eclampsia.

9. As the whole subject is yet so very obscure, much further research work along the same lines and many clinical observations are essential to a more definite understanding of the relationship of the thyroid gland to toxæmia, but in view of some results already obtained the field is at least a promising one.

10. It is not improbable that further research may show that the parathyroids have an important relation to the manifestations of the toxæmia of pregnancy.

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THE DIFFICULTIES OF GALL-BLADDER SURGERY

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I CAN think of no better way of introducing my subject, The Difficulties of Gall-bladder Surgery," than by quoting the following case:

F. T., aged 58, came to see me on Saturday, November 15, 1902. For about two years he had been having "bilious trouble"—jaundice and vomiting. He complained that he could not eat anything because he became immediately distressed. He had lost ten or twelve pounds and said he was losing flesh rapidly on account of not eating. He said, "The last attack of pain was this forenoon. It began after eating some water-toast, which was the first solid food I had had for three days. The pain lasted till I took a tablet of morphine — half a grain. I have taken this only in acute attacks."

The previous attack was on Wednesday morning, November 12, 1902. The patient said that the attacks seemed to him to depend on the taking of solid food.

Physical examination showed tenderness in the epigastrium. There was no tumor.

The operation was on November 24, 1902. The omentum, transverse colon, and duodenum were adherent to the under surface of the liver, deep in the cavity just above the foramen of Winslow. There was a stone in either the remains of the gall-bladder or the cystic duct. This stone, which was about the size of a large pecan nut, but rather shorter, was removed. The outside was soft and crumbling.

A large tube was sutured into the remains of the gall-bladder with a wick extending to the foramen of Winslow. The patient made a good recovery from the operation and remained well until the following May, 1903, when he was seized with pain at the pit of the stomach and with vomiting. The pain required morphia.

On April 9, 1903, the patient had become jaundiced.

A second operation was performed on February 14, 1905. An incision five inches long was made through the scar of the former gall-bladder operation, just outside the right rectus. When the peritoneum was opened, a mass of old adhesions was found about the scar and between it and the transverse colon and duodenum. The scar was thin and weak. After the adhesions had been separated, the transverse colon pulled down, and the outside of the duodenum partly freed, a hard mass could be distinctly felt occupying apparently the head of the pancreas. The induration seemed to extend up the common duct. There were several slightly enlarged lymph glands about the duodenum.

In consideration of the probably cancerous nature of the tumor, the difficulty of the operation, and the desire on the patient's part not to have a drained wound, the operation was stopped at this point, and the wound carefully closed.

I recall now vividly the "feel" of this tumor. I remember how characteristic of cancer I thought it, and how unmistakable. I had no doubt that this poor fellow was doomed to die, after a heroic struggle for health. But he did not die; his health even improved. Though at the time he was stricken in health he was a wealthy man, business reverses were added to physical ills, and he had to fight for re-establishment both of health and business. Why the man should have benefited by the second operation, I cannot imagine, unless the manipulations of the operation rearranged the facetted gall-stones so that bile could pass. After a while his symptoms recurred. His physician, relying upon my diagnosis, supposed the case hopeless on account of cancer, and the improvement one of the ups of a downward course. But still the patient held his own, and, by 1908, the diagnosis of cancer was pretty well disproved. I then made up my mind that my diagnosis of overlooked stones, based upon a digital examination of the tumor and what I thought to be cancer of the pancreas could not possibly be anything else than one or more stones in the common duct.

The third operation was performed on February 12, 1908. Examination showed general bulging about the scar of the former operations evidently owing to stretching of the whole wound. A small, hard mass was felt in the region of the head of the pancreas. An incision was made along the old scar for four or five

inches directly into the omentum and thinned-out fascia. An entrance into the abdominal cavity was found high up on the outer side of the wound, and the adhesions were separated and tied off enough to permit of access to the under side of the liver, the common duct, and the duodenum. All this region was covered and hidden by old adhesions from the former operations. No gall-bladder was seen. In the common duct, low down, could be felt a large stone or several stones. The common duct had been dilated to a diameter of nearly an inch. The duodenum, pylorus, and pancreas seemed normal.

An opening was made into the common duct, longitudinally, over the stones, and two large, somewhat kidney-shaped facetted stones were removed. They were each an inch long and three-quarters of an inch across. Besides these, a number of much smaller stones and fragments were picked out and the duct then washed out with salt solution. It was so dilated that it admitted the forefinger upward into the liver and downward to the duodenal opening. A moderate-sized rubber tube was sewed in with silk stitches.

"The convalescence of this patient from operation, with complete restoration to health, illustrates better than any other case that I have had, the uncertainties of desperate gall-bladder surgery."

I fancy I can read the thoughts of many within the range of my voice: "Why, that was simply bungling surgery, and there was no necessity of taking three bites at a cherry which should have been disposed of in one." May I not be permitted to add that the case above cited is not one of my own, but of no less a surgeon than Dr. Maurice H. Richardson, of Boston. Dr. Richardson is a great surgeon because he has done, carefully and well, a vast deal of surgery; but he is a still greater teacher; for, standing as he now does on the topmost round of surgical achievement, he passes on to us below in order that the thoughtful student may profit the more thereby, not the brilliant successes which have been his, but rather the bitter and gloomy failures which creep into every man's work.

The first difficulty to be encountered in gall-bladder surgery is in the *diagnosis*. Some cases — forming decidedly the minority — come to us labeled. The several — or more oftentimes many — violent attacks of cramp colic, extending over a period of months, or even years; a jaundice varying in degree, duration, and intensity, with, most likely, a history of chills and fever — Charcot's fever; the more or less serious impairment of gastric and intestinal digestion; these symptoms, coupled with a suddenly tender and sensitive gall-bladder, form a picture not easily mistaken. That is to say, given a lesion whose manifestations are frankly both objective and subjective, and there is seldom room for doubt.

Yet, many cases are by no means so sharply defined; often it is that the objective signs are poorly marked, if present at all, and the surgeon is wholly dependent upon the history.

I am convinced that, in obscure cases, history-taking and a careful collating of the cardinal points therein require better judgment and a higher order of intelligence than does the physical examination. Not that the interpretation of what one feels, sees, hears, and smells is unimportant. No. Yet, for the physical examination one has to consider only his own personal equation, whereas, in weighing histories, the personal equation element varies infinitely.

To illustrate:

Mrs. J. D. W., white, aged 33; married and the mother of four healthy children, consulted me in the spring of 1907 for indigestion. The previous history is irrelevant, save for the fact that she had suffered, some two years previously, with an attack of what she termed acute gastritis, lasting some four or five weeks. Since this time she has never been entirely free from gastric symptoms, and of late they have become much augmented. The physical examination revealed nothing save a small area of tenderness in the epigastric region; no history of appendical or gall-stone colic could be obtained and examination of stomach contents and fæces was negative.

A tentative diagnosis of gastric ulcer was made and she was given the usual digestive mixtures and restricted diet with no improvement. She was then sent to the hospital and given the Lenhartz treatment for ulcer of the stomach with considerable improvement.

She returned home after several weeks and was making, as I thought, a very nice recovery. About a month after her return home, while sitting at the sewing machine, she was suddenly seized with violent pain in the epigastrium. I saw her some two hours later, and, in the light of my former diagnosis, promptly concluded that she had sustained a perforation of the gastric ulcer and advised immediate operation.

Upon opening the abdomen, there bulged into the wound a large, dilated, cystic gall-bladder with many adhesions to the transverse colon, duodenum, and stomach, the pylorus being drawn far up out of its normal position. There was no ulcer of the stomach or duodenum. Destruction of these adhesions, which also obstructed the cystic duct (there were no stones)

with drainage of the gall-bladder, gave her prompt and permanent relief.

After the operation, upon questioning her more closely and delving far back into her past, it was ascertained that, some ten or twelve years previous, she had had an attack of typhoid fever, complicated by a relapse. These facts, in the light of our present knowledge of the close relationship existing between typhoid fever and biliary tract infection, would serve to explain the beginning of her trouble.

The point, then, to be emphasized in this connection is: Given a patient with vague digestive symptoms, the one most important thing first to obtain is a minute and careful history. This must include not only the present disability but every other one that could have any possible bearing on the digestive tract. Let it be borne constantly in mind that the two most frequent agents producing infections in the gall-bladder come from the lower digestive tube, viz.: the colon bacillus and Eberth's bacillus.

The second difficulty in gall-bladder surgery lies in the *prognosis*. The term prognosis — from the patient's viewpoint, at least, means a great deal.

The prognosis, in this class of surgery, depends much upon the pathological lesion existing, as well as upon the ease and safety with which a given lesion can be interpreted and remedied. Often, to be sure, the surgeon can state, with almost absolute certainty, that a stone is in the cystic or in the common duct; or that the stones are limited to the gall-bladder. Yet, even here, is he not often mistaken? What, at the outset, gives promise of being a simple uncomplicated case, may, before its proper completion, lead him into the depths of the abdomen, the pancreatic head, or into the liver itself.

First, must be considered the *operative mortality*. Mayo, in a review of 1,500 operations on the gall-bladder and ducts gives it as 4.43 per cent. For cholecystostomy 2.13 per cent; for cholecystectomy 3.13 per cent; for choledochotomy 21 per cent. Viewed, then, from the standpoint of mortality, cholecystostomy is the safest for the average case and must be considered the normal operation.

The *operative disability* is a factor which, with the average patient, must also be reckoned with.

It is but right that the patient should be given an approximate estimate of the amount of time required in bed, as well as the total disability from work. In uncomplicated cases, with a not too long incision through the right rectus muscle, he should be up in 12 to 14 days and out of the hospital in 16 to 20 days.

Another question which will always be asked, and very naturally and properly, is, "Doctor, am I to be permanently relieved, and is there danger of these gall-stones returning?"

The answer to the first question is, "Yes, if I get all of your stones"; to the second, "No, if I get all of your stones." It is very rare indeed, for stones to re-form in a gall-bladder which has been properly drained; the Mayos, in their series of 1,500 cases, report but one recurrence.

Under the head of *third difficulty* might properly be placed the technical points in the execution of the operation itself.

No other one organ, unless it be the brain, offers such a wide scope in the possibility of embarrassing technical complications as does the gall-bladder and its ducts. Contrast the simple cholecystostomy on a lean, clear-skinned female with the choledochotomy on an obese, short-coupled, jaundiced male. The points of similarity end with the skin incision and their wide variation can be appreciated only by the man who has sweat blood over a deep-seated common duct stone.

Cholecystostomy, as a rule, is an easy and safe operation and where the stones, or the infection, are limited to the gall-bladder itself without having produced any permanent damage, will seldom fail to give absolute and permanent relief.

It would seem a difficult matter to overlook a stone or stones in so accessible a region as the gall-bladder or cystic duct, and yet I assure you that it is very easy. In many of these cases the stones are very small and soft and abound in countless numbers, and to be confident that all have been reached, is most difficult.

I recall such a condition in one of my cases: Upon the completion of the operation, and after the removal of a considerable number of

these soft stones from the gall-bladder and cystic duct, I felt reasonably sure that all would be well; yet the drainage was very unsatisfactory until, after repeated injections of sterile olive oil into the gall-bladder, quite a number of these stones were thrown off. Even after this, the recovery of this patient was somewhat tardy, showing partial cystic duct obstruction from the prolonged inflammation and pointing out, also, the lesson that a cholecystectomy would have better served the purpose in this case.

I repeat, then, that to overlook a stone or stones may become a very easy matter; and for the inexperienced operator, I fear, not an infrequent occurrence. And the chagrin of it is that the overlooked stone, in nine cases out of ten, is just the one which should not have been overlooked, because it is the one, which, being tucked snugly away from the field of touch and vision, is sure to again create mischief.

Broadly put, stones tightly impacted in the cystic duct with a distended and moderately diseased gall-bladder, call for cholecystectomy rather than cholecystostomy; experience has taught us that such gall-bladders are largely functionless, and further, that drainage through them is unsatisfactory and hazardous. This question or whether or not to remove the gall-bladder in any given case is sometimes quite perplexing.

Perforation, gangrene, malignancy, and severe cystic obstruction call for extirpation of the organ. Until quite recently, that is, until the great value of the gall-bladder as a drainage tube for chronic pancreatic disease was established, cholecystectomy was practiced quite too often, I am sure.

W. J. Mayo, in a recent article on pancreatitis (SURGERY, GYNECOLOGY AND OBSTETRICS, December, 1908) takes a more conservative stand than formerly regarding the removal of the gall-bladder; he states that chronic pancreatitis is a very much more frequent complication of biliary tract infection than was formerly supposed and that when it does exist and the gall-bladder has been removed, we are not likely to permanently cure our patient; while we have, at the same time, destroyed our most promising hope of relief by removing the very thing which, at second operation, is almost imperative for satisfactory drainage of the pancreas — namely, the gall-bladder.

It should be remembered, too, that the mucus-secreting function of this organ is an important factor, as well as that of relieving tension in the common duct.

In an article by Jno. F. Erdmann (*New York Medical Record*, Feb. 13, 1909) reporting 104 operations on the biliary tracts, 53 cholecystectomies were made. In my opinion, quite too many gall-bladders are removed. He states: "I am not so radical now and consider the cases more closely before performing cholecystectomy."

The gall-bladder is an important organ and has definite functions to perform; and it is safe to predict, I think, that as the surgical aspect of pancreatic disease matures, for this reason, if for no other, fewer gall-bladders will be sacrificed.

Should cholecystectomy be decided upon, the operator must provide ample space through which to work and this is best secured either by the Mayo-Robson incision — a prolongation of the upper end of the incision inward and upward for an inch or more toward the midline; or better still, by the Bevan incision, which prolongs, in a curved direction, both the upper and lower ends of the incision. This permits of the liver being dragged down from under the ribs and diaphragm and brings the cystic and common ducts much nearer the surface. The dissection may now be executed without much difficulty, starting from below and working up. The operator should bear in mind the possibility of injury to the portal vein — which is not great — and of troublesome hæmorrhage from the substance of the liver if the dissection is carried too close to that organ.

In work involving the common and hepatic ducts, the steps lead one more deeply, and here the Bevan incision, with rotation of the liver well out of the wound, is very essential to easy and thorough work. The novice is very prone to materially hamper himself and to lose valuable time by not providing sufficient room through which to properly carry on his manipulations. It should be remembered that a stone in the common duct may be very elusive and

when once located, should be tenaciously clung to; if released, it may drop back in the hepatic ducts, never to again be recovered. Collins, of Illinois, in the March issue of SURGERY, GYNECOLOGY AND OBSTETRICS, describes an ingenious device in the shape of a forcep, the ends of which form an incomplete ring, for holding a stone in place in the common duct while it is being removed; after removal, the grasp of this forcep may be used to hold up and to steady the duct while the drainage tube is anchored in place.

After removal of the stone, the duct must be carefully palpated, both from within and from without; for the possibility is great of there being still other stones lurking behind in this locality.

Some difficulties, also, are presented in the after treatment of these cases. It should never be forgotten that the keynote of success in gall-bladder surgery is drainage.

Most cases of biliary tract infection are of long standing and represent a low grade form of infection; and while, at no time, possibly, actually threatening life, yet, owing to this very insidiousness, the infection has been slowly creeping from gall-bladder to cystic and common duct, and from these to hepatic ducts and thence far up into the depths of the liver. In order to remedy this condition thorough drainage is necessary and should be kept up until the bile has assumed a perfectly healthy light-golden tint and until the mucous membrane of the gall-bladder has regained its former tone, requiring, sometimes, three, four, or even five weeks.

Murphy, of Chicago, makes observations as to the healing processes going on within the gall-bladder by the frequent use of the endoscope, and does not allow tubular drainage to be dispensed with until healthy granulations assert themselves.

No anxiety need be felt about the closure of the wound after the removal of the tube, provided the cystic duct is patulous; a biliary fistula with clear mucus discharge means an overlooked stone in the cystic duct.

In case of common duct stone, the majority of these cases will best be cared for by free drainage of this duct, the drain being inserted well up toward the hepatic ducts, with a second drain placed to the lower side, in order to provide for leakage.

In addition, before the tube is inserted, the common duct should be thoroughly explored and dilated down to and including the papilla opening into the duodenum. Should any stones have been overlooked in the hepatic ducts, they can find an easy exit into the intestine and subsequent trouble be thus avoided.

Should the gall-bladder be not so much diseased as to require removal, drainage should be provided through this also; it must be recalled, however, that in most cases of common duct obstruction, from stone, this organ is contracted, atrophied, and functionless, and aside from the help given us in drainage, is of no practical value.

Such, in frugal outline, are a few of the difficulties to be encountered in this broad field of surgery. He who proposes to do the better part by both his patient and himself should earnestly strive to early arrive at a definite diagnosis regarding the nature of lesions in the upper abdomen. By so doing he will save for his patient much suffering and remove for the surgeon many of the perplexing difficulties which hover around these cases.

A METHOD OF OBTAINING MORE RELIABLE KNOWLEDGE OF THE EXACT AREAS OF PAIN COMPLAINED OF BY PATIENTS AFFLICTED WITH VISCERAL DISEASE

By PHILANDER A. HARRIS, M. D., Paterson, New Jersey

WITH a hope of obtaining more accurate knowledge of the location of pain complained of by patients afflicted with disease of the abdominal and pelvic viscera, I have for some time required that nurses mark the skin in such manner as to show all the localities of pain.

Nurses were further required to enter in their notes descriptions of the character, severity, continuance, cessation, and recurrence of pains.

A number of areas of pain occurring in one region of the same patient, led me to the development of a distinct code for marking the skin. This code has eliminated certain errors and the consequent embarrassments which attended the use of the simpler markings which I first employed.

The careful acquirement of a large quantity of such material in connection with operative findings and post-operative history may, possibly, result in average or composite pictures for some pathologic conditions sufficiently distinctive to enable us to attach far greater importance to the subjective symptom pain, as it may be illustrated upon the patient's body, than we have in the past associated with our less accurate knowledge of the real location and extent of painful areas.

The teachers and pupils of nursing are supplied with copies of my standing instructions for the prosecution of this work.

In order that others may pursue this work for whatever interest may attach thereto, or for whatever advantage may accrue therefrom, I present below a copy of instructions to nurses. I should, however, like to discourage anyone from introducing these rules in his hospital work, who will not exact from the nursing system a strict compliance with their provisions. If this work is worth doing at all, it is worth doing well, and no omission by a nurse should be twice excused without reproof.

The attending physician, or his assistant, should copy all markings from the patient's body to the history book at his earliest convenience.

The marking of the skin at painful localities is distinctly the work of the nurse in charge of the patient, while the transference of such markings to the history book is just as distinctly the work of the physician.

STANDING INSTRUCTIONS TO NURSES FOR MARKING THE SKIN OF PATIENTS WHEN PAIN IS COMPLAINED OF

When any patient in my service mentions the existence of pains or complains of pain, the nurse must at once ask the patient to indicate with her own hand, so far as she can reach, the exact locality of pain, and the nurse shall at once mark, with the marking fluid provided for this purpose, such area, center, or radiation of pain.

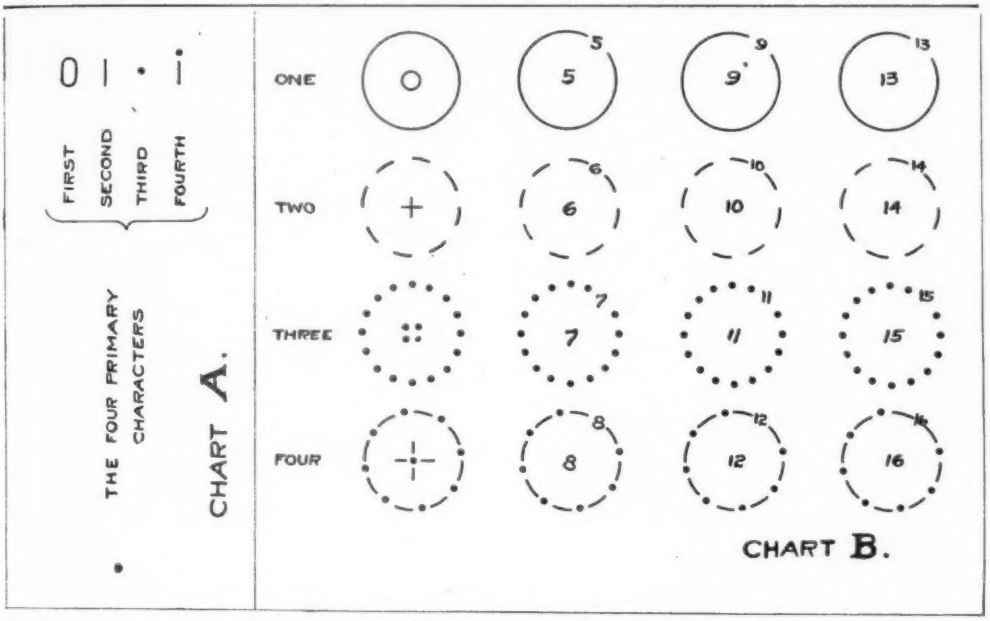
One of the most important points pertaining to skin marking of pain, is the numbering in ascending succession each and every distinct location of pain.

A patient may have not only a number of localities of pain, but she may also have several distinct areas of pain in one region of her body. In order, therefore, that every distinct marking of the patient's body may at any time be readily identified, and its numerical position in that patient's list of pains be at once recognized, it is essential that nurses and physicians associated with me, shall familiarize themselves with the "marking code."

The nurse will more quickly learn the marking code, if she first commits to memory the characters which figure so constantly in skin markings, and which are expressed just beneath in Chart A.

It will be seen on examination of the above chart that the first of these characters consists of a continuous or unbroken line.

That the second character consists of a broken line or a dash.



Skin Marking Code of Philander A. Harris

That the third character consists of a dot.

That the fourth character consists of a dash and a dot.

The above chart shows how the four primary characters are employed in constructing the boundary lines marking all areas of pain, and how these characters are also used to mark centers of pain to the fourth marking inclusive.

Beginning with the fifth localization of pain Arabic numerals are employed for the purpose of successive enumeration and identification of all centers of pain, and also of all boundaries of pain. After the fourth marking the primary characters continue to be used to mark all boundaries and radiations of pain, but they cannot, however, be used indiscriminately. They may be used over and over again, but only in serial form as shown in Chart B.

I not only wish to mark areas and centers of pain, as shown in Chart B, but I also desire to mark radiations of pain and painful points, as they may occur independently of areas of pain.

If, in every instance, a patient had but an area of pain, and, originating with it, a center of more intense pain, Chart B would serve as an example for the marking of all her pains; but since a painful point may occur independently of a surrounding area of pain, and since a radiation of pain may originate from either of these or independently of them, it becomes necessary for the nurse to learn how to mark the skin in such manner as to identify any, or part, or all of these qualities of localization.

Practically, it becomes necessary to mark:

1. Simple areas of pain.
2. An area of pain with a painful center.
3. An area of pain with a center and also a radiation of pain.
4. An area of pain without a center of pain, but with a radiation of pain.
5. A painful point without a surrounding area of pain.
6. A painful point with a radiation of pain.
7. A line of pain without a special severity at any point in its course.

It will be observed in Chart B that all the

centers of pain within painful areas beginning with, and following the fifth marking are both expressed and identified by Arabic numerals.

An examination of Chart B will also reveal the fact that any particular primary character is only available for every fourth marking. That the first primary character can only be used in the first, fifth, ninth, thirteenth, and every fourth marking thereafter.

That the second primary character can only be used as a part of the second, sixth, tenth, fourteenth and every fourth marking thereafter.

That the third primary character can only be used as a part of the third, seventh, eleventh, fifteenth and every fourth marking thereafter.

That the fourth primary character can only be used as a part of the fourth, eighth, twelfth, sixteenth and every fourth marking thereafter.

A primary character must not be used to mark a painful point, or a center of pain, for any but one or other of the first four markings of a patient. The Arabic numerals alone are available for marking a painful point or a center of pain after the first four markings of a patient, and to identify radial and boundary lines.

With such knowledge as has been gained from the examination of Charts A and B, together with the descriptions of, and references thereto, I wish to direct your attention to a number of distinct and entirely fanciful markings which we might imagine to have been made upon a single patient, and which the sixteen figures given in Plates I and II are intended to illustrate.

Figure 1 shows the first marking upon a patient, whom we assume complained of a painful area, a center pain within the area, and a radiation of pain. It will be seen that the area of pain, its more painful center, and the radiation of pain from the area of pain, are constructed from the first primary character.

Figure 2 shows the second marking upon the patient who complained of a painful area with a more painful point within, which we designated as a center pain. The boundary of the painful area is formed from the second primary character, as is also its center of pain shown by the Greek cross.

Figure 3 shows the third marking upon the patient who complained of simply a painful point. The four dots arranged in equi-latero-quadrangular formation shows the manner of marking a painful point or a center of pain from the third primary character.

Figure 4 shows the fourth marking upon the patient illustrating a painful area and a center of pain. The markings are constructed entirely by employing the dash and the dot, which constitute the fourth primary character.

The marking of the patient in Figure 5 demonstrates a painful area and a center pain. The Arabic numeral 5 within the circle shows the center of pain, while the Arabic numeral 5 appearing in the boundary line of the painful area distinguishes this marking from the first marking of the patient, when the first primary character was employed without an Arabic numeral.

Figure 6, which is the sixth marking of our patient, shows simply an area of pain indicated by a succession of dashes derived from the second primary character. This sixth marking is distinguished from the second marking of the patient by the insertion of the Arabic numeral 6 in the outer boundary line of the painful area.

Figure 7. The Arabic numeral 7 at the beginning of the arrowed, dotted line, shows a painful point, and the dotted line shows the direction and extent of the radiation of pain.

In the eighth marking of the patient (Figure 8), the outer boundary of the painful area is constructed from the fourth primary character, and is distinguished from it by the insertion of the Arabic numeral 8 in the boundary line. The appearance of the figure 8 at three distinct points within this marked area of pain indicates three distinct centers of pain.

The Arabic numeral 9 in the ninth marking of the patient indicates a painful point, while the continuous arrowed line constructed from the first primary character, illustrates a radiation of pain from the marked painful point.

Figure 10 shows a recurrence of pain in the same region as shown by the second marking of the patient. In this tenth marking of the patient the boundary of the area of pain is constructed from the second primary character. The number 10 in the outer boundary line of the area, distinguishes this boundary line from the boundary line of the second marking which occurred in the same region having a longer and narrower area. The number 10 in this tenth marking shows the location of the center of pain, and distinguishes it from the center of pain indicated by the Greek cross of the second marking of this patient.

The boundary line of the eleventh marking of the patient is constructed by the employment of the third primary character and contains the number 11 to distinguish it from either the third or seventh marking.

The twelfth marking of the patient, showing an area and a radiation of pain constructed from the fourth primary character, has a point or center of pain of greater intensity at the location of the number 12.

Figure 13 shows the thirteenth marking of the patient at the locality of the twelfth marking. It will be seen that a previous radiation of pain is replaced by an elongated and wider field of pain, and a center of pain at number 13. This thirteenth marking is outlined by the first primary character, the only one, of course, which may be used in connection with the thirteenth marking. It is distinguished from the first, the fifth,

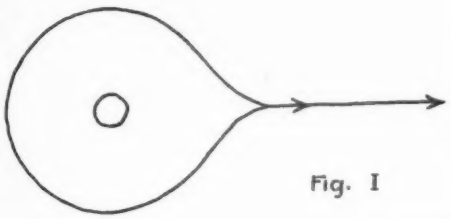


Fig. I

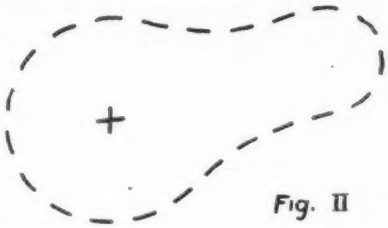


Fig. II

Fig. III

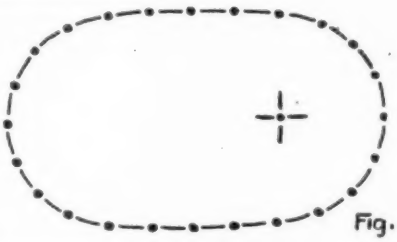


Fig. IV

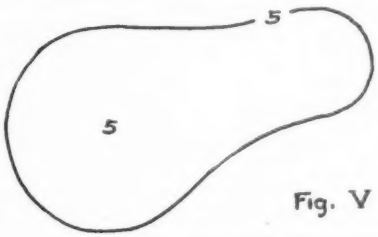


Fig. V

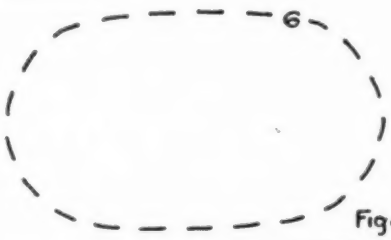


Fig. VI

Fig. VII

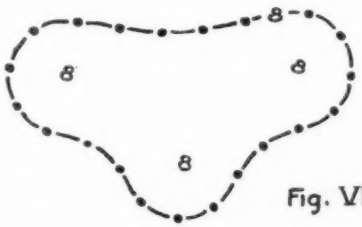


Fig. VIII

Fig. IX

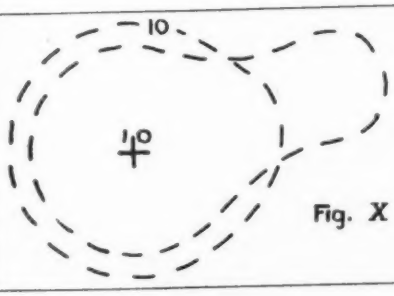
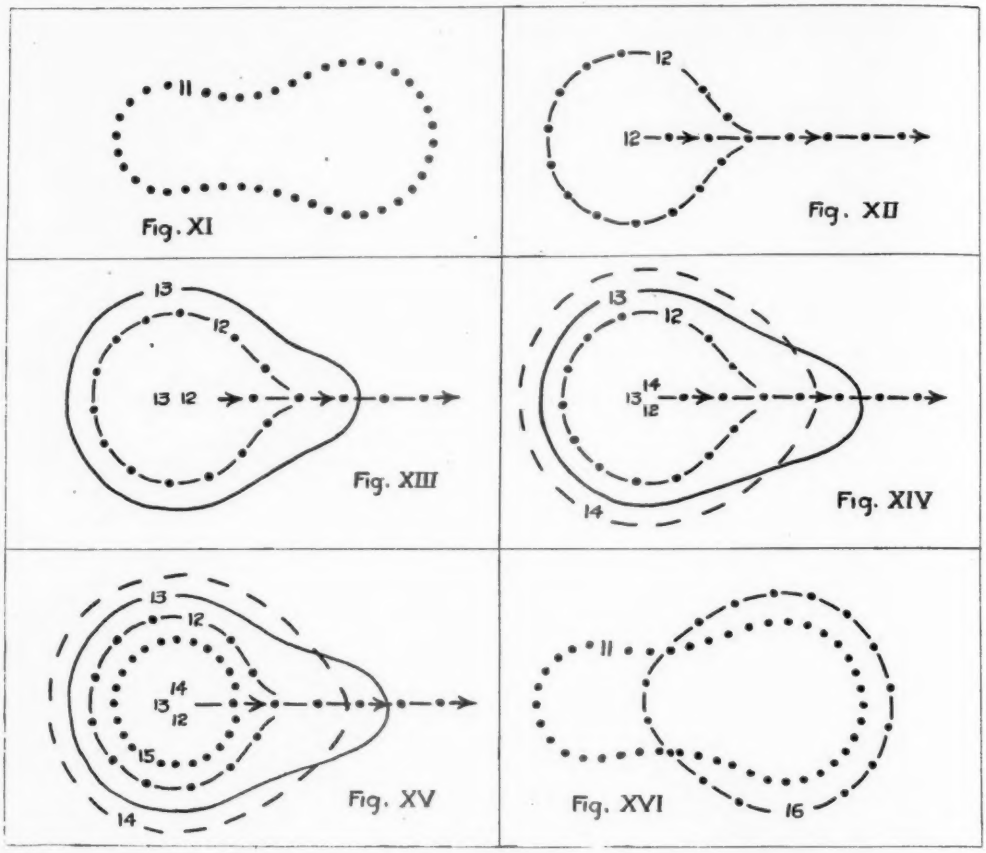


Fig. X



and the ninth markings of the patient by inserting the number 13 in the boundary line.

Figure 14 constituting the fourteenth marking of the patient demonstrates a still larger field of pain complained of by the patient at the locality of the twelfth and thirteenth markings. Its boundary is constructed from the second primary character, and marked with the number 14 as is also its accompanying center of pain. A boundary line for the fourteenth marking could not be constructed of other than the second primary character.

The circle of dots appearing in Figure 15, and representing the fifteenth marking of the patient, is constructed from the third primary character, and has the number 15 in its boundary line for the usual purpose of identification. This dotted line in Figure 15 shows a smaller area of pain complained of at the locality of the twelfth, thirteenth, and fourteenth markings.

Figure 16 shows the area of pain, the markings of which are constructed from the fourth primary character and surrounding the greater portion of a painful area previously shown by the eleventh marking. As Arabic numerals have not appeared in either the eleventh or the sixteenth marking as shown in Figures 11 and 16, we are to infer that there was no particularly painful center within either of those painful areas.

GENERAL CONSIDERATIONS

Each new field, radiation, and center of pain, originating, occurring, and connected together, must have but one identification number. Any one of these occurring independently of the others, must have its own individual identification number.

Every painful spot, area of pain, or radiation of pain originating at one time, but not connected with one another, or which do not meet, or are not included in one painful field, must have a separate identification number. An

area of pain originating at the locality of a previously marked area of pain, but with a larger, smaller, or with a differently shaped field than any existing marking, must have its own identification number.

An area of pain occurring to-day, which is within, and much smaller or much larger than a previously marked area of pain, or if the pain occurring to-day extends partly within and partly without the boundaries of a previously marked area, the area of to-day must be regarded as a new area, and receive a distinct identification number. All pains recurring as previously marked must be referred to in the nurse's notes as "recurrence of pain as per marking number —."

It very often happens that a patient is quite comfortable and free from pain when lying upon her back in bed, or when in some other position of repose, but when she attempts to turn to one side or the other, or when she changes from one posture to another, or when her arms, or legs, or head, or body are flexed or extended, pain is produced. Sometimes pain is produced by walking, by standing, or even by lying down. Sometimes the taking of food or drink, topical applications, or a cathartic dose of medicine, injections under the skin, or into the vagina, or bowel, produce pain.

Inasmuch as I wish to have marked all localities at which pain is mentioned or complained of, the nurse must not omit her duty in this relation because of any theory she may have regarding the cause of pain. She may, however, enhance the value of her service in this relation, by entering in her notes, or communicating to me any theories or facts which she may hold regarding the cause of pain in any patient. Nurses are expected to enter in their notes the date and hour at which any pain originates or recurs, together with a brief description of its character, severity, continuance, cessation, and recurrence.

Radiations of pain. In visceral disease, radiations of pain are not nearly so common as areas of pain; but they occur with sufficient frequency in connection with areas of pain, with centers of pain, or independently of either, to render it desirable that such radiations be marked upon the skin. The markings for all radiations of pain must be constructed from the particular one of the four primary characters available for that purpose.

If a painful area and a radiation of pain originate together, the marking of the painful area and the radiation of pain must have the same identification number.

If, from an area which was previously painful and marked, a radiation of pain occurs independently of the marked area, the radial line must be constructed from the particular one of the four primary characters then available for use in marking radiations of pain. In marking radiations of pain, arrow points must be places at intervals across all radial lines in the direction of the last pain.

Simply painful points. It sometimes happens that a patient complains of pain in a very small area an inch or less in diameter. The nurse must then simply mark the skin with the next unused primary character or Arabic numeral, available for that purpose.

Recurrences of pain. The nurse is expected to make an entry in her bedside notes of all recurrences of pain, but she must be particularly careful to satisfy herself that recurring pains referred to, or complained of, have the same areas, the same centers, the same radiations, and that the painful points are identical in location with the markings which already appear on the skin of the patient. She is not to take the simple nod of the head or the wave of the patient's hand, nor always the word of the patient that the pain is in the same place as before marked, without uncovering the patient's body, and asking her to indicate the exact location of pain. If she finds that the area differs considerably from an area already marked, if the location of a center of pain differs from one already marked, if a radiation of pain differs in length or direction from the radiation already marked, or if the location of a painful spot differs from the location of one already marked, she is to place a new marking with its proper identification number.

Maintenance of the serial and successive numbering of markings and removal of markings before discharge from the hospital. Nurses must be particularly careful not to duplicate an identification number.

When markings upon a patient's body have

been copied in the history book or on the history sheets, I, or those who represent me, may order the removal of such markings from the patient's skin. In all such instances the nurse must enter in her bedside notes a memorandum showing by whom the markings were effaced, and also the number of the last marking. She must also attach her signature in her bedside notes to these statements.

Should the appearance of pain require additional markings of the patient, the first one occurring after the effacement of previous markings must bear the particular identification number next succeeding the last marking.

All markings must be removed from patients before they are allowed to leave the hospital. The nurse in charge of such patients, however, must be particularly careful to determine whether markings which still appear upon the patient's body have all been transferred to the history book or the history sheets. If such transdelineations have not been made, she must at once notify me, or my representative, in order that arrangement may be made for copying the markings before effacement.

Markings are often ordered effaced for the express purpose of finding if pains afterward complained of are referred to the same regions, and have characteristics similar to those expressed by the effaced markings.

Accidental defacement, and partial effacements. Through friction, washing, perspiration, or other topical applications, markings sometimes become less distinct or invisible. The nurse must examine and re-mark all such accidental or unintentional effacements. She must maintain all markings until they are ordered removed. She must know, too, that they have been copied in the history book before removal.

Regarding disposition of marking when operation is ordered. When operation is ordered for a patient bearing skin markings, the nurse must, before the time arrives for preparing the patient for operation, learn if the skin markings have been copied in the history book. If they have not been reproduced in the history book she must give proper notification to me or my representative in order that arrangement for transference of the markings from the patient to history book or sheets may be made. When the nurse is informed by me or my representative that all markings are copied in the history book, she may prepare the patient for operation without any regard to defacement or effacement of skin markings.

As to post-operative pains. After a patient regains full consciousness from the anæsthesia, the nurse shall mark all post-operative pains which are complained of by the patient, no matter in what part of the body the pains appear, or whether the nurse regards the pain as connected with the operation or not.

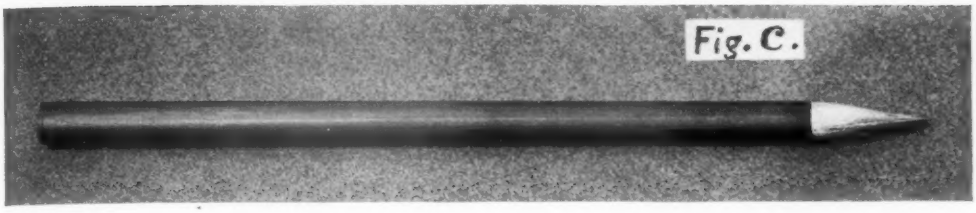
How to proceed when plasters and underlying dressings are in the way of marking the skin. Whenever plasters are in the way, the nurse is instructed to mark the dressings in the same manner as if they were skin. Excepting with my permission or that of my representative, marked dressings must not be removed until markings have been copied in the history book.

Parts of the body which must not be marked except by permission of the patient or by special order. The nurse must not place markings upon the head, face, neck, hands, or forearms of any patient, nor upon such portions of the body as are not ordinarily covered with clothing. Patients must not be marked if they object thereto. If a patient objects to having her skin marked the nurse must enter in her bedside notes the fact of the occurrence of pain together with a reference to the patient's objection and is to direct my attention to the matter at my next visit. When a patient's body cannot be marked, the nurse is to make an entry of the occurrence of pain in her bedside notes, referring to the particular region or regions at which pain is complained of.

The marking fluid. The marking fluid is the ordinary fuchsin stain used by bacteriologists. (For want of a better marking fluid I have used this stain upon negroes. Upon very dark skin, however, it is not a very satisfactory way to mark.)[1] When negroes and persons of very dark skin are ordered marked for the purpose of photography, Draughtman's white drawing ink may be used.

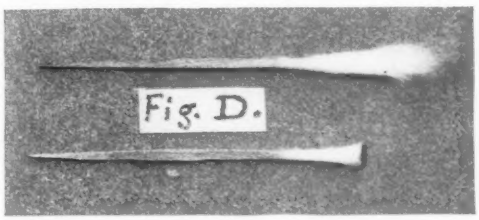
Applicators. A small camel's hair brush may be used.

[1] The author will be greatly obliged to any one who will suggest a better marking fluid for negroes.



The Chinese artist's brush shown in Figure C, procurable in any Chinese laundry, and also usually sold at art stores, and which ordinarily costs five cents, is available for the purpose of doing particularly true work intended for photography.

Brushes should be washed clean in running water after using and laid aside to dry. After washing the Chinese brush it should be shaped by the fingers to a point as shown in Figure C and put away to dry.



A wooden toothpick, a parlor match, or a splinter of wood, one end dipped in water, and wound with surgeon's cotton, the cotton squarely cut off with scissors one-eighth of an inch below the end of stick as shown in Figure D, makes an applicator which, when dipped in the marking fluid, forms a most excellent substitute for a brush.

The round dots of the third and fourth primary characters may be more quickly and neatly rounded with this swab than with any brush I have used.

I offer below a few photographs from life, showing skin markings as they were acquired by patients during their stay in the hospital, together with brief clinical histories. I also exhibit two photographs to show the transference of markings from patient to history book.

In Figure 17 will be seen the first and only marking, and consequently the only pain complained of by a patient three weeks before operation for bilateral salpingitis.

Figure 18 shows the only pain consisting of an area and a center of pain complained of in the seven days prior to the removal of double pus tubes. The left pus tube was much larger than the right. The localization of pain on her right side was due to active inflammatory movement on that side.

Figure 19, inoperable cancer of the uterus. By the first marking it will be seen that the first pain complained of after admission to the hospital consisted of an area of pain in the lower right iliac region with a center of pain within. When the pain was more severe and she received the second marking, the pain centered at the same point as in the first marking, but the painful area was very much enlarged and extended to her left side. Two other cases of advanced cancer of the uterus have shown similar markings.

Figure 20. The first and third markings upon this patient represent two areas, each with a center pain occurring after abdominal Cæsarean section. This was the second time I had performed abdominal Cæsarean section upon this patient. With the concurrence of the patient and her husband, I exsected the uterine ends of both Fallopian tubes for the production of sterility before closing the abdomen. It is presumed that the two centers of pain shown in the first and third markings of this patient were due to lifting out the insertions of the tubes, and the closing of the chasms in the uterus. The second marking of this patient which consisted of dashes was upon her back, and consequently not shown in this illustration.

Fig. 17.

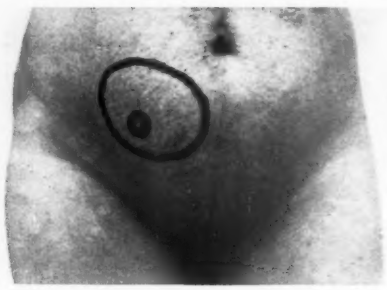


Fig. 18.

Figure 21 is to illustrate the pains complained of by a patient after a primary and secondary operation for closure of a large vesicovaginal fistula. The fistula for which she was first operated upon was 1½ inches in length, was located just anterior to the cervix uteri, and had resulted from a difficult childbirth two months before her admission to the hospital. In the week or more that she was in the hospital prior to operation, she made no complaint excepting of the constant flow of urine. When I visited the patient on the following day she bore the first marking. It will be seen that the pain included the hypogastric region, the pubic region, and extended down an inch or two on the inside of both thighs, a little lower upon her left thigh than upon the right. Inasmuch as this patient did not complain of any pain before operation and since the only operation to which she was subjected was the sewing of her vaginal fistula, we are to presume that the traumatism inflicted at the region of the fistula was the sole cause of pain at the area included in the first marking. This pain also extended all over the perineum. The patient urinated without difficulty after the operation, and the indications pointed to a complete healing of the fistula; the pain complained of within the area of the first marking ceasing about two days after the operation. Through an error of my assistant, the patient was allowed to get up and walk about on the seventh day. Urine escaped from the vagina on the day following,

Fig. 19.

Fig. 20.

thus revealing the fact that the object of the operation was partly defeated.

The fistula not closing, I five weeks later performed the second operation. When I visited the patient on the day following its closure, there appeared the second marking upon her body as shown by the line of dashes. By referring to the illustration in Figure 21, it will be noticed that it extended only slightly on the hypogastric region, and was very much narrower than the area of pain after the first and larger operation. It extended on the thighs as distinctly shown in the second marking, also on the perineum. Catheterizations were not resorted to after either operation, but there was doubtless some infection of the bladder, for it happens that about ten days after the complete closure of the fistula I found the third marking upon my patient with a center of pain in the hypogastric region as shown by the dots. This painful area over the bladder was accompanied with frequent and painful urination. Cystitis had undoubtedly kindled in the bladder. She had not quite recovered from the cystitis when she left the hospital.

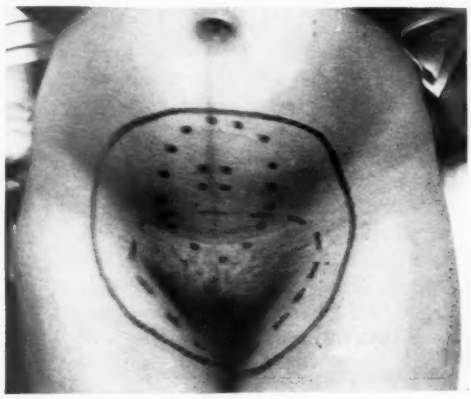


Fig. 21

Fig. 22.

Figure 22 shows the first, second, and third and only markings to represent three distinct areas of pain with three distinct and accompanying centers of pain, occurring in a child of sixteen who was believed to be suffering from tuberculous salpingitis.

Figure 23 shows a enter of pain and part of an area of pain, the marking illustrating the only pain complained of by a patient in plain, unaided abortion. The extent of the area of pain indicated by the first marking is further shown by the continued line in Figure 24. Two or three days later the patient complained of pain as shown in the second marking in Figure 24. In a few instances I have found that office patients suffering with endometritis when asked to mark themselves, return to me with a girdle surrounding the body and resembling the first marking shown in Figures 23 and 24.

The first marking as shown by the continuous line in Figure 25 represents the only complaint made by a patient with double pus tubes, prior to operation. Her left tube was larger than her right tube, but the localization of the pain upon her right side was probably due to progressive inflammatory movement upon that side. Shortly after the operation she suffered from inability to empty the bladder, and consequently received the second marking, consisting of dashes. A little later she received the third marking showing an area and a center of pain in the epigastric region. A great many cases of abdominal section receive a marking at the epigastric region, soon after operation.

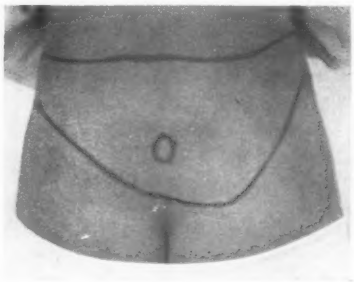


Fig. 23.

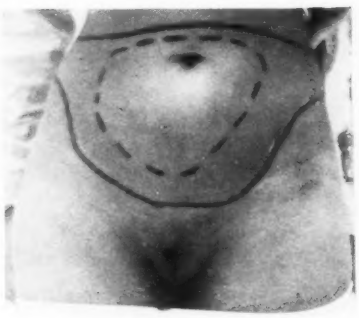


Fig. 24.

The patient shown in Figures 26A and 26B entered the hospital with a pelvic abscess containing six or eight ounces of pus which had formed after delivery. When I first visited her in the hospital she presented the first marking, which consisted of a rather large area with two painful centers within. It will be seen that one painful center was in the median line, the other in the left iliac region. The abscess, which was almost entirely to the left of the median line, was discharged through vaginal section. Two weeks after operation when I considered her about ready to leave the hospital, my attention was directed to a marking upon the posterior surface of the right leg, showing a large circle

Fig. 25

Fig. 26A.

Fig. 27.

of dashes and a center of pain indicated by the Greek cross, and shown in Figure 26B. Pain extended up the leg and thighs as shown by this line of dashes and arrow points, terminating at the right groin. The pain in this patient's leg was very intense. On the following day the right thigh was slightly enlarged. There was much less pain at the region of the second marking, while a new area and a center of pain were marked in the right groin; affording a beautiful picture of the subjective symptom pain as it affected the patient in the beginning stages of crural thrombosis.

Fig. 26B.

The three distinct markings appearing in Figure 27, all having a center pain, show the localizations of pain complained of by a patient prior to operation for bilateral salpingitis.

Figures 28 and 29 represent the ordinary stamping of the female figure in the history book for the particular purpose of copying the markings from the patient's body. Upon the anterior view of Figure 28 may be seen three markings, a first, second, and third marking, each representing an area and center of pain. Upon the posterior view shown in Figure 29 will be seen the fourth marking, consisting of an area, a center, and a radiation of pain, and the sixth marking, consisting of a painful point on the inner side of the left scapula indicated by the Arabic figure 6.

Figures 30 and 31 represent the stamping of history book for localization on the right and left sides of the body. Figure 29 is a copy of the first marking, representing an area of pain without any particular center of pain and was complained of for about three weeks before hæmorrhage appeared in the urine. The second marking shown in Figure 31 represents pain complained of in the region of the heart of the same patient.

In transferring skin markings from patient to history book, the bony landmarks of the patient should guide the trans-delineator.

Although the umbilicus constitutes a soft part, it is nevertheless a most valuable landmark to the copyist. If the figure stamped in the history book does not have a marking for the umbilicus, the trans-delineator should always place a large dot to indicate its location. The umbilicus is not always on a plane with the iliac crest. It is sometimes a little lower and very often quite a good deal higher than a line drawn across the body from the highest points of the iliac crests.

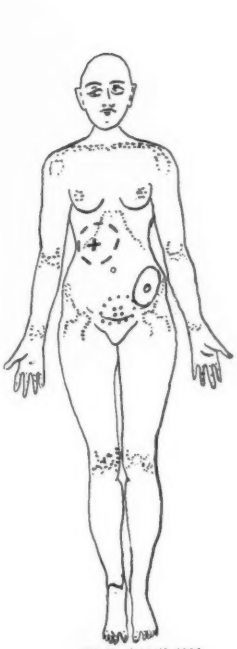


FIG. XXVIII.

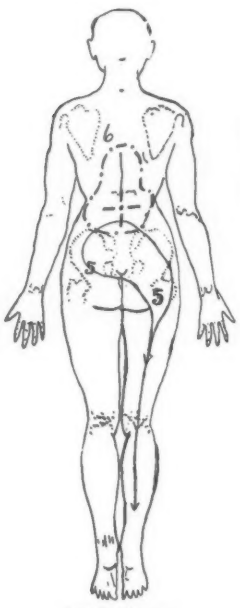


FIG. XXIX.

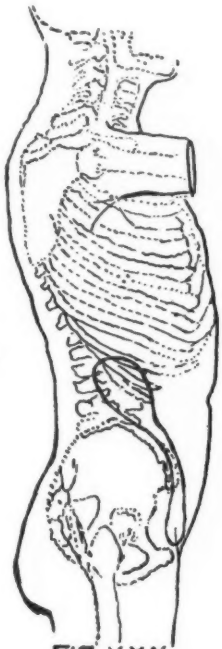


FIG. XXX.

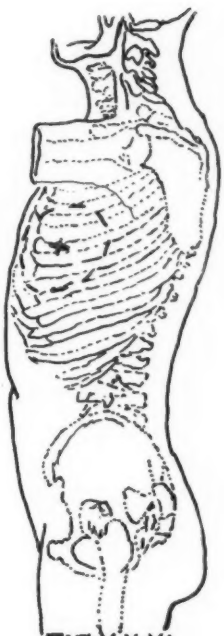


FIG. XXXI.

The nipple in the male forms a good landmark, but it should never be relied upon as a landmark in the female on account of its liability to very great changes of position. Obesity, emaciation, age, lactation, and other conditions which affect the size and shape of the breast, may occasion an upward, downward, or lateral movement of the nipple of several inches in one individual, from one time to another.

TYPHOID SPINE; WITH THE REPORT OF A CASE[1]

By JASPER HALPENNY, M. A., M. D., C. M., Winnipeg, Canada
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THERE is no doubt that some of the cases of painful spine following typhoid fever have definite, gross pathological lesions. These have been shown to exist where deformities are present; some have been demonstrated by the X-ray; and thus some of the cases are removed from the class of pure neuroses. Thus far no case, as far as I am aware, has been reported where a post-mortem has been held, as no fatal case has occurred. Following Osler's comments on his cases many were skeptical as to Gibney's first contention that there is "an acute inflammation of the periosteum and the fibrous structures which hold the spinal column together." Even now such a diagnosis is looked on with grave suspicion by some surgeons and orthopædists. The condition is rare and yet important and in spite of the increasing number of cases being reported, it should be kept before the profes-

[1] Read before the Sixteenth International Medical Congress, Budapest, in the Section on Orthopædic Surgery, August 29, 1909.

sion until the pathology is better understood, and the profession at large are more or less familiar with the symptoms and treatment.

CASE REPORT

Patient, D. McBane, a physician, practicing in Rainy River, Ontario, aet. 28, weight 175 lbs., height 6 feet 2 inches. Never had any illness except migraine, which he had at times since 15 years of age. A sister had also been a sufferer from this trouble. During the autumn of 1906 he attended many cases of typhoid fever and boarded at a hotel where there were four or five cases.

Had slight chills about December 12th, and took his temperature once; it was normal. At the same time he had moderate diarrhœa. During the next five days he had anorexia, very marked, headache, and great weakness, but went about his work though he had to rest very often. On December 17th, he had several severe chills during the afternoon and felt very weak and sick, but did not take his temperature. For five days more he continued to drag himself about, but all the time with anorexia, headache, diarrhœa, and excessive weakness.

On December 22d he was unable to keep going any longer. Temperature now taken for the first time since December 12th was found to be 104 degrees. During the night he became delirious and remained so more or less till January 4th. I first saw him in consultation December 30th. I found that the day before he had had eight involuntary stools, one described by nurse as "pea soup stool," that he was quite delirious, and did not sleep well. There were no pathological findings in the lungs, kidneys, or heart. The Widal test and Erlich's diazzo test were not obtained, no facilities being at hand for obtaining them. There were the typical rose colored spots and the patient had all the cardinal symptoms of typhoid fever. Distention had been present, but had disappeared.

For one week the patient continued to improve till the temperature was almost normal. The parotid glands then became inflamed and the temperature rose to 102 degrees. I was called to see him again on January 6th, and found both parotids very much swollen, but otherwise patient better than at last visit. From this time on he made an uninterrupted but slow recovery. By January 31st, the temperature reached normal for twenty-four hours where it remained.

On March 5th, the patient came to Winnipeg where I saw him for the third time. He was then able to walk about and complained of nothing except extreme weakness, and polyuria. He passed as much as 120 ounces in twenty-four hours, having now a trace of albumin, but no sugar. He was carefully examined again but nothing was found other than as stated above. He went to St. Thomas, Ontario, a distance of 1,570 miles.

After going east I did not see the patient for eight months. The following account of his further illness was written for me by himself. During this illness I was in constant communication with his family and I told them repeatedly that from the account given me I thought it could not be tubercular caries of the spine, but a case of typhoid spine. In August, as stated below, a third physician from Johns Hopkins Medical School also diagnosed typhoid spine.

Between March 5th and 9th patient traveled from Rainy River, Ontario, to St. Thomas, Ontario, via Winnipeg, stopping one night in Winnipeg and one in Toronto, making a journey of fifty-six hours. Patient did not feel fatigued from journey and had no pain in back but was very weak on exertion. Remained quiet at home in St. Thomas for ten days and gained rapidly. Albumin disappeared from urine.

On March 18th drove several miles, on March 19th, drove about ten miles, on March 20th, drove about ten miles. On March 21st, drove ten miles over rough frozen roads in cold weather and patient was very cold that night on arriving home. Had some pain in lumbar region of back that night, back a little stiff in morning but not painful. On 22d, drove ten miles over rough roads in cold weather and back was quite painful that evening. Remained quiet in warm house next two days but pain in back (lumbar region) was very severe. Patient thought it was lumbago, took salicylate, etc., but got no relief. On Sunday March 25th, had severe chills in forenoon and temperature went to 104 degrees. Pain in back lessened some and temperature came to normal by Friday March 30th, and remained normal until Tuesday April 3d. Pain very severe now, more on right side and specially so if patient stood up or back got cold. Had to crawl on hands and knees from couch to bed. On April 3d, temperature started up and by Wednesday April 11th, it reached 102 degrees. Pain in back very severe, patient could not turn in bed, pain ran around the right side following the 3d, 4th and 5th lumbar nerves. Seemed worse at lateral branches and terminals of these nerves and the first lumbar and dorsal nerves became affected toward the end of the week, and lower lumbar nerves were less painful. The area supplied by these nerves was slightly hypersensitive but not red or swollen. Had some pain in left side of back, but it did not run around to left side. No referred pain in hip, leg, or testicle, but slightly in right groin. Last dorsal and lumbar spines very painful on pressure and spine absolutely rigid from sacrum to cervical region. To pick pin from off floor would bend knee and hip, and to assume erect position of spine, patient would climb up on himself with hands pressed firmly on legs from knees to hip, until erect posture was regained. Knee jerks slightly increased especially right, no ankle clonus, pulse 120 to 130. Rubbing and mustard blisters had no effect on pain. Hot water bottles (very hot) best to relieve the pain. Had to be continually applied, and when it got cold the pain would wake the patient. The pain was worse at night. Appetite was poor, patient vomiting considerable, and was sleepless. On April 11th, diagnosis of tubercular caries of the lower dorsal region was made by two physicians, and patient ordered to remain absolutely in bed.

Until April 23d, patient remained about the same. Temperature 102 to 104. Pulse 110 to 130. Pain in

back and right side excruciating at times. Never absent, and worse at night or if patient became cold. Codein and coal tar products had no effect on pain. Morphine ¼ grain hypodermically every four to six hours and hot water bottle continually applied were the only means of relief.

For the next five weeks after April 23d, temperature lessened very slowly to normal, pulse lowered to 80. Appetite improved, pain became less and could be controlled by hot water bottle except at night when morphia gr. ⅓ had to be given by hypodermic. All this time patient had to be turned in bed and hot water bottle applied constantly. Not much pain in left lumbar region, but in right lumbar region and at lateral branches and terminals of last dorsal and lumbar nerves. Pain on pressure on dorsal and lumbar spines became less. Patient remained in bed until last week in June, when he had a fixation apparatus made and commenced to get up for a short time each day. Could bend spine and rotate vertebræ in bed, but did not attempt it while up. Weight on July 1st was 162 lbs. All symptoms gone by this time except occasional slight pain in back in evening. During July was up about two hours each day and always wore fixation apparatus when up. Could bend spine by middle of July.

About August 1st was seen by a third physician who diagnosed typhoid spine and advised more exercise. Commenced driving about August 10th, and light work on August 15th, when fixation splint was abandoned. Weight now was 175 lbs. If he took much exercise back would feel a little weak but not painful. During latter part of September did any kind of hard manual work with lots of bending and lifting and no bad effects.

There was never any curvature of spine and height never varied. There was neither pain nor limitation of movement after September 1, 1907. Patient thinks he could have moved his back on July 1st, when he got up, but was advised not to try to. Patient owes his recovery to his long rest in bed after April 11th, and thinks he would have had no attack if he had not traveled over the rough roads so soon after his severe attack of typhoid fever, and that the attack of typhoid fever would have been much less severe if treatment had commenced earlier, but "a physician is his own worst patient."

At the date of writing two years after the attack of typhoid and sixteen months after recovery from the spinal trouble, patient is in his usual health. He made a complete recovery and has had no recurrence.

REMARKS

The fact that the attack came so soon after typical typhoid fever, that it came on so acutely, that there were lacking some of the salient features of an acute tubercular spine and that the patient made a most complete recovery seem to prove the case to be one of typhoid spine. The fact that the temperature rose to 104 and the pulse to 130 would surely prove that the case was more than a neurosis. It was unfortunate that the patient was too far from any town to have an X-ray picture taken. This should be done in all these cases when possible that we may learn what is the actual pathological condition which will account for the excruciating pain, the prominent symptom.[1]

FREQUENCY

In Winnipeg for ten years ending December 31, 1908, there were 7,133 cases of typhoid reported. In the Winnipeg General Hospital in twenty-six years there were 4,605 authentic cases of typhoid collected and tabulated by Pierce. In all these numbers no case of typhoid spine has occurred that I can find. During my residence in the Winnipeg General Hospital and in private practice I have seen about 1,800 cases and I know that only this case occurred in this number. This condition, therefore, is a rare one, and it would be useless to work out its frequency in percentage.

ANALYSIS OF REPORTED CASES

A fairly careful search of the literature has disclosed 72 cases including the one here reported. In the foreign languages I was assisted by Dr. Carl H. von Klein of Chicago.

It is not presumed that this is an absolutely complete record of all cases reported. None have been omitted which were available, but it is a difficult task to search the literature so well that one could say no case has been overlooked. Only three of the cases rejected by Silver have been left from this list; viz.: Crittenden's, Pahl's, and Guyot's. Arapove's cases are quite well enough reported when the original article is seen. The following personal communication regarding Herrick's two cases places them undoubtedly in the list of authentic cases.

"Each patient was a male, one was about forty-five years of age and the other a little younger. The symptoms of typhoid spine appeared as convalescence was being established. In one case, I remember, the patient had already been put upon light diet. I am unable to tell how long the symptoms lasted, but know that both patients made a slow recovery, the treatment being practically that of rest in bed, with sedatives for

[1] After this paper was written I had the opportunity of seeing a second case through the kindness of Herbert W. Wadge, B. A., M. D. Patient, Henry Boles, was 50 years old. Coal heaver 24 years. At age of 10 had rheumatism, and again at age of 33 was laid up 18 months with that disease. Had pneumonia at age of 43. Drank heavily for many years. No tuberculosis in family. Typhoid fever ran a mild course, the temperature ranging from 100° to 103°. Rose spots were present; there was diarrhoea. Neither the Widal nor Erlick's diazzo reaction were used, the patient refusing to go to the hospital. Was in bed four weeks. Ten days after getting up, the temperature rose to 101.2 and remained above normal for four days. Pain came on suddenly one week after the rise in temperature. The onset was quite sudden and occurred while the patient was quiet in bed. It remained severe for about three weeks and required morphine at times to control it. There was local tenderness over the lower dorsal and the lumbar region but no swelling or redness. There was no shooting of the pain down the thighs nor into the testicles, neither was there any girdle pain. The least motion caused pain, but more particularly flexion. At the time I first saw the patient, nine weeks after the onset of the spinal trouble, he was able to sit up with assistance. There was no loss of knee jerk, no ankle clonus, no change in sensation, and no pain while still. There was marked pain on effort at flexion, less on rotation. There was tenderness over the last two dorsal and first three lumbar spines. There was no redness or swelling. There was no deformity. The lungs, heart, and kidneys were normal. The appetite had been good all through the spinal illness with the exception of a week at the onset of the pain. There was enlargement of the liver, with considerable ascites. Patient took treatment largely into his own hands and remained quietly in bed till pain was gone; then began to move about cautiously, and back was rubbed by his wife. Sixteen weeks after the onset of the pain he was out of bed and in eight weeks more was doing light work at the time of writing this. X-ray examination was refused.

the control of pain and nervousness. The nervousness was in neither instance a striking feature of the case; and were it not for a slight rise in temperature, the definite localization of the tenderness, with, in one case, a slight but still very distinct swelling, one might easily have regarded the case as a neurosis."

Weigel's case is sufficiently reported, Vickery's sufficiently to establish the diagnosis, an X-ray having been taken, Gibney's Tysolian case should in all justice be recognized, and the cases of Osler and Eskeridge are also sufficiently authentic to be included. The two cases reported by Zenker were males and that reported by Schanz was the wife of a physician, therefore, all three are included. In Silver's article the name of Weir takes the place of Wirt, the latter being the correct name.

Age. The age is mentioned in 52 cases, the oldest being 56 and the youngest 8 years in one of Gibney's cases. The majority were in adults between the ages of 20 and 35.

Sex. The sex is given in 64 cases, there being 53 males, 83 per cent nearly, and 11 females, 17 per cent.

Original fever. The length of the original attack of typhoid was given in 33 cases, and the average of these was 5⅓ weeks. Considering the fact that the average stay in the Winnipeg General Hospital of 4,605 cases during twenty-six years was 37.8 days, one would be led to believe it is not necessarily the severest cases which go in for this complication. Bearing on this point we find in the thirty-three cases above mentioned that 17 were classed as severe while the other 16 were said to be moderate or mild.

Time of onset. This point is referred to in 60 cases, in five the onset occurring during the attack of fever, in 40 during convalescence, and in fifteen after recovery. The latest time given was 4 years, in one of Winokurow's cases, where the lesion was in the lumbar region, but there was no deformity and complete recovery ensued.

Cause of onset. This is referred to in only thirty cases in all of which more or less injury was sustained. Some of these are as follows: fell while skating (two, Osler and Gibney); severe jolt while riding in car, one (Osler); picking up bag of grain, one (Wirt); and driving long distances over rough frozen road, one (author's case).

Mode of onset. In 39 cases the onset was stated to be gradual and in 10 cases the pain came very suddenly followed by other symptoms later.

Location. Out of 39 cases in which this point is mentioned, 35 were in the lumbar region, 4 sacral, 6 dorsal, 1 cervical, 4 dorso-lumbar, 4 lumbo-sacral, and one in the right iliac region.

Thus in 69 per cent of the cases the lumbar region was involved alone or with the neighboring vertebræ, in practically 56 per cent, the lesion being lumbar only.

Pain. This is the prominent symptom, and is mentioned as being excruciating, or uncontrollable without morphine in 18 cases, and in many instances it is referred to as being very severe. In Duncan's case a bedsore formed in which a small hard central mass seemed to be the cause of most of the pain. When this mass was removed the pain diminished. Later the resulting scar was cut down on and all pain disappeared, which he thought due to a nerve caught in the scar tissue and cut in operation. In Konitzer's case the pain was "excruciating" and was aggravated by all movements of the body except the arms. In this case there was no swelling, no redness, no deformity, no change in the sensation of the skin, and the recovery was rapid. In Ogilvy's case even raising the arm from the bed would cause a spasm, and marked pain and tenderness were complained of over the costosternal junction of the sixth rib on the right side, where was found a distinct enlargement. Breathing was painful. A distinct kyphosis of the seventh dorsal spine was present.

In view of the many cases where distinct deformities are found and that the X-ray shows a pathological condition in a certain percentage of cases; in view of the temperature and other symptoms of acute illness in many cases, it seems that one would not, even in the absence of these, be justified in calling the case one of hysteria. Some slight weakening of the spinal ligaments may be responsible for nerves being caught, which would give excessive pain without other symptoms. Moreover the hysterical feature of bone disease due to typhoid has been observed to be present where the lesion was in parts other than the spine. Bridges reports a case of involvement of the seventh costosternal junction on the right side, both femurs and both tibiæ. The costosternal and both tibial swellings discharged pus, the femoral cleared up without suppuration. This patient "was exceedingly restless, sleepless, and hysterical." After an attack of typhoid fever, there is more or less nervous exhaustion, and it is not to be wondered at that severe pain makes some patients hysterical, nor should we doubt the presence of definite pathological lesions if the hysteria be the prominent symptom.

Temperature. In 18 cases temperature is stated to have been present; the highest being 104° reached in Connor's and MacRae's cases and the case here reported. The longest time I find temperature recorded was in the author's case; viz., for about two months. This case might be considered a relapse of the typhoid coexistent with the spinal lesion but the temperature seemed to keep pace with the pain in the spine in such a way that it suggests a causal relation. In 17 cases temperature is stated not to have been present. Thus it is found that of the cases where temperature is mentioned there is practically an equal number with and without this symptom.

Leucocytes. In MacRae's second case these were normal. In his first case the count on the day of admission was 11,000, and two days after it fell to 6,000. In Silver's case one count was made, there being 10,100. In Connor's case it is interesting to note a considerable increase. On the day of the onset of the pain the count showed 11,800; two days later the number had increased to 14,400 with 83 per cent of polynuclears; three days later 17,600 with 84 per cent polynuclears. In this instance on the 23d day of the disease, temperature 101° pain was first felt. "Coincident with this pain

the temperature rose to 103.5° and remained high for three or four days." The first blood count was made on the day of the onset of the pain. The third day after the onset "pain in the spine was present only on motion." Thus it is seen that the rise in temperature, the leucocytosis, and the severe pain were definitely associated. It is not stated what the blood count was after the three stated above. However, this much information is very significant as is also the bearing on the other symptoms of the rest in bed. There was no tenderness on pressure, no deformity nor disturbance of reflexes, no ankle clonus, and no Babinski's sign. In 21 days from the onset of the pain, the patient was able to sit up. A radiograph on the 28th day showed a filling in of the fourth lumbar intervertebral space.

Local signs. Tenderness was present in 22 cases, thickening or swelling in nine cases, and bedsores or abrasions in two cases. Hypersensitiveness was also present about the seat of pain extending down the thigh or about the sides of the body even to the abdomen. In 12 cases it was stated that no swelling, tenderness, or other local symptom was present other than the pain on movement. Indirect pressure, such as striking the top of the head, caused pain in many instances.

Sensory disturbances. In a few of the cases hypersensitive areas are described at either side of the spinal lesion; in one of Osler's cases this condition extended along the posterior third of the crest of the ilium. Zenker's first case showed disturbances about the ribs on one side. Hyperæsthesia is mentioned also by MacRae and Ogilvy. It is definitely stated in 13 cases that no such disturbances were present.

Reflexes. Ankle clonus was present five times, the knee jerk was increased in 8 cases and diminished in 2, and Kernig's sign was present once. The reflexes were normal in five instances.

Muscles. This point has not been dwelt on in many instances. Silver considered that in his case more muscular atrophy was present on the side on which the radiograph showed the most extensive lesion in the vertebral column. MacRae also observes that the radiograph in his second case showed "the intervertebral space between the third and fourth lumbar vertebræ on the right side was slightly encroached upon by a bony deposit"; and that "the muscles of the right leg showed marked atrophy, the measurements being much less than those of the left leg."

Spinal deformity. In 23 cases deformity is stated to have been present and in 19 cases it is stated to have been absent. The deformity varied from a "slight prominence" (Cutler and MacRae) to marked kyphosis and skoliosis. In Wirt's case there were two prominences, one over the sixth, seventh, and eighth dorsal and the other over the first, second, and third lumbar vertebræ. Also in one of MacRae's cases there was "a double skoliosis with the convexity to the right in the scapular region and to the left in the dorsolumbar region." The outcome of this deformity is not referred to except that 45 days after being discharged, the patient "stated that except for slight stiffness in the lower back he was free from any symptoms of his illness."

In only three cases (Ogilvy, Painter, and Schintz) is the deformity stated to have remained. It is noteworthy that of the 23 cases temperature was stated to have been present in only five instances, the onset of pain was sudden in 4 cases and gradual in 18, the pain was said to have been very severe in all the cases and neurotic symptoms were specially mentioned in 15, in some of which the term "hysterical" was used and in all an opiate had to be administered. From these facts it may fairly be concluded that in those cases where marked neurotic symptoms are present without evidences of gross pathological conditions there may, nevertheless, be distinct pressure on some of the posterior nerve roots at their point of exit. That is, for want of absolute proof of actual bony or other gross lesions it would seem unwise to class these cases as of a purely neurotic character.

X-ray report. A radiograph was reported in only 11 cases, Connor one, Cutler one, Lovett one, MacRae two, Myers two, Petteshon one, Silver one, and Weigel one. In Connor's case there were "distinct bony changes in the lumbar vertebræ," in Cutler's case nothing was found, in Lovett's case distinct bony changes were observed, MacRae found "deposit of new bone" in two cases. "In the first two it filled in the intervertebral space between the second and third lumbar vertebræ, apparently being deposited in the lateral ligament and forming bony union between the two vertebræ. In the second, the process extended from the second to the fifth lumbar vertebræ and appeared to involve both the lateral ligament and part of the intervertebral disks." In the first of Myers' cases "a synostosis between the second and third lumbar vertebræ, with loss of height from disappearance of the intervertebral space, was observed." In his second case there was "clearly a synostosis of the eleventh and twelfth dorsal vertebræ, with diminution of height owing to the disappearance of this intervertebral space." In Petteshon's case nothing abnormal was found. In Silver's case "the vertebral bodies seemed of normal thickness, but the space between them, corresponding to the intervertebral disk, was absent, and the shadow representing the body of the first lumbar passing without any line of demarcation into that representing the body of the second; over this area the shadow was of increased density. On the right the lateral borders of the two vertebral bodies formed an unbroken curved line; on the left there was an irregular shadow projecting outward between the transverse processes." A radiogram taken five months later, showed that this lateral curve had disappeared.

Caries. In Duncan's case two ulcers over the sacrum, one on either side of the median line, the size of a half dollar, occurred during the original attack of typhoid and on one of these a hard mass appeared in which a nerve seemed to be involved in cicitricial tissue to such an extent that most of the pain apparently arose from this. However, if the bone had been involved it would have been stated. One of Myers' cases, a female, was taken ill with typhoid November 1st, three weeks of temperature, then a relapse of two weeks more with rose spots, had commenced to have spinal pain during

the first week. Patient was encouraged to sit up, but pains became worse and pleurisy was found. Again the patient was induced to sit up and "in about a week a great curve appeared suddenly, three vertebræ being involved." Two days later, about March 15th, a plaster jacket was applied under suspension. On February 12th, an odor was noticed, and on the jacket being removed "an abscess was found to have discharged freely, and there was a large granulating wound over and to the right of the eleventh and twelfth dorsal spines." Dr. Myers' first examination on April 12th "showed a well marked kyphosis at the tenth, eleventh, and twelfth dorsal spines; over this and to the right is an ulcer, one inch by one and a half inches, with a sinus one inch deep leading towards the transverse processes, but no exposed bone is felt; no psoas contraction, no pelvic fullness. The abscess closed May 24th, reopened November 6th, and closed again in three weeks. Has remained closed since."

In one of Painter's cases an abscess was present over the lumbar region, but it is not stated that exposed bone was observed.

In Weigel's case "at the first examination a large swelling was discovered in the right iliac region, which was hard and at one point somewhat softer and fluctuating. The thumb passed into a cup-shaped depression on the ilium, where the bone had evidently been eaten out." A radiograph was taken which showed this depression, and the author regarded the case as an infectious osteitis. The case apparently went on to recovery without a discharge of pus, or an actual demonstration of bare bone.

In Fichtner's second case caries is mentioned, and it is the only case in which I find a definite statement of its presence. He says "Beide Falle heilten aus, endigten jedoch mit volleger Verstirfung der Lendmwerbelsaule; nur im Zweiten Falle hildete sich ein 'Gibbus.'"

Thus in only one case out of seventy-two is it stated that caries was present. In many of the other cases it was stated to have been absent. Myers' case, however, gives strong presumptive evidence of actual breaking down of bone as does also Weigel's case.

Pathology. Nichols has demonstrated the following lesions in the cord in patients dead from typhoid. The number of altered nerve cells were numerous, more particularly in the lumbar region. The cell and the dendrites were increased in size. In advanced cases there was a partial or complete solution of the chromatic substance, advancing from the nucleus to the periphery, the center of the cell showing as a mass of pale, flocculent looking material and studded everywhere with small, round refractive bodies. The nucleus was large and swollen and sprinkled with a finely granular deposit. There seemed to be a diminution in the number of processes, perhaps an illusion due to the great increase in size.

Eberth's bacillus was found in the marrow of the ribs and breastbone in eight out of the nine cases by Quincke and Stuhlen, and in the spleen seven times. They found, however, that the bacillus was more numerous in the spleen than in the marrow.

Fraenkel set himself the task of finding the bacillus typhosus in the marrow of the spine. Ten cases were examined bacteriologically, and in each case the bacillus was cultivated from the marrow of the vertebræ, but in greater numbers in the lumbar region than elsewhere. It is his opinion that in every case of typhoid the bacillus enters the marrow early in the disease and persists in a more or less active state till the sixth week. This pathological finding is in keeping with the clinical reports which, as already stated, show that in 69 per cent of the cases the lumbar region was involved.

Enough evidence is cited in the paragraph on X-ray to show that in some cases at least, gross bony pathological lesions occur. Whether cases reported in the future show symptoms due to the lesions of the cord described by Nichols remains to be seen.

In this connection it might be noted that insanity, temporary or permanent, sometimes ensues from typhoid fever. A detailed study of the brain cells, as has been done by Nichols in the case of the spinal cord, will, no doubt, reveal more or less definite changes, and these cell changes will probably correspond very closely with those described by Nichols. The mental symptoms would point to such changes; and such lesions in the cord will probably cause symptoms in cases reported hereafter.

Length of disablement. This is referred to in thirty-four cases and in most of these the time was about three to five months. In one of Morehouse's cases, a man of twenty-eight years of age, at the expiration of 18 months some soreness was still present. The longest time given was two years, this in Duncan's case.

Recurrence. In the 58 cases in which this point is mentioned not one has occurred.

Treatment. The treatment which has given the best results consists of rest, postural or mechanical, or both, according to the case, tonics, preferably nux vomica, opiates when required. Gibney recommends the cautery, stating that it has proved so valuable in his hands he would now regard it as the most valuable single agency.

CONCLUSIONS

1. The sequela of typhoid fever, known as "typhoid spine" is not a neurosis; it is characterized by more or less definite, local, pathological lesions which are sufficient to account for the symptoms.

2. Until the pathology is better understood, the name "typhoid spine" is perhaps preferable to the term "typhoid spondylitis," or the spondylitis may not always be present, and again there may be a cord lesion of mild form in some cases.

3. It is a rare affection with a good prognosis, though usually a slow course.

4. The most essential point is an early diagnosis, for with early treatment it is robbed of most of its serious symptoms.

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CANCER MORTALITY[1]

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THAT cancer is a disease world-wide in its distribution, frequent in its occurrence and having an abnormally high mortality rate has long been recognized. For many years the hope of combating the cancer problem rested entirely in the wish that its exact nature and cause would some day be discovered and then, and not till then, would we possess the means of eradicating or curing it. Thus for a long time the physician was wont to look upon the disease as an incurable one, and the patients drifted into the hands of quacks who reaped a golden harvest of dollars while the unfortunate sufferers reaped added misery and pain. Of late, however, a new era has dawned and we know we have, even with our present limited knowledge, with the early recognition of the disease, methods which are potent to cure if not eradicate.

Unless the public and medical profession are made to realize what a terrible scourge this dreadful disease is we cannot hope to arouse sufficient interest and enthusiasm in the problem to render fruitful the truths which the subsequent speakers will enunciate. This is the object of this paper which will deal entirely with a statistical study of the disease as it affects particularly the United States.

In the fifty years from 1850 to 1900 the population of the United States increased from 23,191,876 to 75,994,575 or 3.27 times. In the same period the death rate increased from 322,721 to 1,039,094 or 3.22 times. It

[1] Read before the Philadelphia County Medical Society, April, 1909.

would seem then that in spite of our added knowledge of bacteriology as applied to hygiene and sanitation, there has been practically no proportionate decrease in death rates as compared to population. It must be remembered, however, that it has been only during the past twenty years or so that we have been able to make practical application of our knowledge in relation to the prevention of disease. If we compare the death rates in the registration area of the United States for the years 1890 and 1900 we will find that there was a marked decrease. In 1890 the death rate for 1,000 population was 19.6, while in 1900 it was only 17.8, a decrease of 1.8. This represents in a population of 28,807,269 (registration area) a saving of 51,852 lives annually. If the death rate was the same for the entire United States (it is probably smaller as the non-registration area is mostly rural in character) the annual saving of life would be 136,789.

It is important to note in this study the causes of this decrease in mortality rates. The following table (12th Census, U. S. 1900, vol. 3, part 1) shows for the registration area the death rates at each age per 1,000 population in 1890 and 1900 with the decreases and increases in the rates.

Age	Death Rates 1900	Death Rates 1890	Decrease or Increase in Rates: Decrease	Decrease or Increase in Rates: Increase
Under 1 year	165.4	205.8	40.4	
1 year	46.8	84.9	38.3	
2 years	20.5	23.8	3.3	
3 "	13.2	16.8	3.6	
4 "	9.4	13.0	3.6	
Under 5 years	52.1	66.8	14.7	
5 to 9 "	5.2	7.3	2.1	
10 to 14 "	3.3	3.8	.5	
15 to 19 "	5.2	6.0	.8	
20 to 24 "	7.5	8.4	.9	
25 to 29 "	8.6	9.9	1.3	
30 to 34 "	9.4	10.6	1.2	
35 to 39 "	11.0	12.5	1.5	
40 to 44 "	12.2	13.5	1.3	
45 to 49 "	15.2	16.5	1.3	
50 to 54 "	19.1	19.2	.1	
55 to 59 "	26.3	26.5	.2	
60 to 64 "	35.1	32.8		2.3
65 to 69 "	52.2	49.0		3.2
70 to 74 "	75.2	64.5		10.7
75 to 79 "	110.5	103.2		7.3
80 to 84 "	165.8	144.6		21.2
85 to 89 "	241.3	215.5		25.8
90 to 94 "	339.2	260.0		79.2
95 and over	418.9	347.1		71.8

This table shows that the greatest saving of life took place in infancy and in precancerous years while in late middle life and old age, the rates have materially increased. The American Experience Mortality Table shows that of 100,000 insured, 723 die annually at age 20; 732 at age 35; 962 at age 50; 1,546 at age 60 and 2,391 at age 70. Thus again showing the greatest saving of life in the early adult years.

Statistics show that all diseases, except the following, decreased in mortality rates from 1890 to 1900:

Disease	Increase in Mortality Rate
Angina pectoris	3.0
Diabetes	3.9
Gastritis	4.4
Pneumonia	5.0
Premature birth	8.5
Old age	9.1
Cancer	12.1
Heart disease	12.2
Apoplexy	17.6
Influenza	17.7
Disease of kidneys	24.0

We see that with the exception of pneumonia and influenza, all microbic diseases have lessened in frequency. The increase in cancer mortality is very marked.

It will be seen from the figures already given that, while there was a general decrease in mortality from all causes of 1.8 per 1,000 population during the period between 1890 and 1900, cancer not only did not decrease, but showed an actual increase of 12 per 100,000 population during this period.

It is frequently stated that this increase is only apparent and not real, being due to more accurate diagnosis and better registration reports. If we study the subject we find that this increase is almost universal, and that the disease shows a proportionate increase in those parts of the body which are readily accessible and in which the diagnosis, on account of its ease, has always been fairly accurate.

In the United States the mortality for cancer and tumor increased from 9 per 100,000 population in 1850 to 29 in 1880, to 33 in 1890, and to 43 in 1900. The proportion of deaths from this cause to 1,000 deaths from all causes increased from 25.3 in 1890 to 32.9 in 1900.

In the registration area the death rate from cancer alone increased from 53 in 1890 to 70.8 in 1906. The following increases for cancer death rates are shown for some of the principal cities in the United States:

New York, from 32 in 1864 to 74 in 1906.
Chicago, from 32 in 1880 to 69.9 in 1906.
Philadelphia, from 31 in 1861 to 79.8 in 1906.
Boston, from 28 in 1863 to 100.1 in 1906.
Baltimore, from 18 in 1864 to 84.3 in 1906.
New Orleans, from 15 in 1864 to 79.3 in 1906.
San Francisco, from 16 in 1866 to 125 in 1906.
Denver, from 65.7 in 1902 to 94.8 in 1906.
Kansas City, from 59.4 in 1902 to 81.2 in 1906.
Syracuse, from 76. 9 in 1902 to 96.7 in 1906.
Washington, from74.9 in 1902 to 82.5 in 1906.

The death rate from cancer in the registration area and its subdivisions for 1901 and 1906 is shown in the following table:

	1901	1906
Registration area	64.5	70.8
Registration cities	65.2	75.6
Registration states	66.2	70.9
Cities in registration states	69.0	78.0
Rural part of registration states	62.7	62.6
Registration cities in other states	61.3	70.3

It will be seen that in all the divisions which go to make up the registration area the death rate from cancer showed a marked increase with the exception of the rural part of the registration states. It should be borne in mind, however, that this slight decrease may be due to the exclusion of those residents of the rural districts who went to the cities for operation.

As previously stated, this increase in death rate from cancer is practically universal. Williams has shown that while the population of England and Wales barely doubled (1850 to 1905), the cancer mortality increased more than sixfold. The cancer death rates in various countries per 100,000 population for certain periods are as follows:

Scotland, from 41.6 in 1861 to 107 in 1905.
Ireland, from 27 in 1864 to 79.3 in 1906.
Switzerland, from 114 in 1889 to 132 in 1898.
France, Paris, from 84 in 1865 to 120 in 1900.
Other cities, over 10,000 population, omitting Paris, from 76 in 1887 to 106 in 1900.
Germany, from 59 in 1872 to 71 in 1900.
Austria, from 37 in 1880 to 70 in 1900.
Hungary, from 26 in 1897 to 39 in 1903.
Italy, from 21 in 1880 to 58 in 1905.
Australia, from 14 in 1851 to 57 in 1901. (Williams.)

In the registration area of the United States during the period from 1901 to 1906 the following number of deaths from cancer occurred:

Cancer of the mouth	4,326
Cancer of the stomach and liver	51,398
Cancer of the intestines	14,934
Cancer of the female genitals	20,404
Cancer of the breast	4,683
Cancer of other and unspecified organs	32,697

During this period the following increases and decreases were noted in frequency as to site of growth:

	Per cent
Increases; stomach and liver	1.8
Increases; mouth	.4
Increases; intestines	.6
Increases; skin	.1
Decreases; female genitals	.4
Decreases; breast	.1
Decreases; other and unspecified organs	2.4

It will be seen that the increases almost exactly equal the decrease in cancer of other and unspecified organs. This is no doubt due to more accurate registration reports. It will be also seen that there is no marked increase which might be due to better diagnosis of inaccessible organs, and that the decrease in those organs which are readily accessible is so small as to be negatory.

Ample statistics have been given to show that the disease is really and not apparently on the increase.

Having shown that cancer is a growing menace to the race let us pause for a moment and see what this problem really means. In England the Registrar-General's report shows that in 1906 out of a total of 141,241 deaths of males over 35 years of age, 12,695 died of cancer, and out of a total of 140,607 deaths of females over 35 years of age 17,671 died from cancer. This means that one man in eleven over 35 years of age will die of cancer, and that one female in eight over 35 years of age will die of cancer. In England the cancer death rate for 1905 was for each 100,000 living 75.6 for males and 100.5 for females. The corresponding phthisis rates being for males 134.7 and females 95.7. This meaning that more women die of cancer than of pulmonary tuberculosis.

In the registration area of the United States in 1906 out of a total death rate for males at all ages of 358,286 there were 11,166 who died of cancer, and out of a total of 299,819 for females, 17,854 died of cancer. This showing that one male out of 32 will die of cancer, and one female out of 11.2 will die of cancer. The corresponding phthisis rates being for males one out of 9.9 and for females 1 out of 10.2. This shows that almost as many women die of cancer as of phthisis.

In the same area for 1906 out of a total death rate of 186,944 for males over 35 years of age, 10,644 died of cancer and out of a total of 156,465 for females over 35 years of age, 16,879 died of cancer. This means that one man in 17.5 over 35 years of age will die of cancer, and one woman in 9.2 over 35 years of age will die of cancer. The corresponding phthisis rates for this age period being for males 1 in 9.9 and for females 1 in 14.1. In other words, more women past the age of 35 die of cancer than of pulmonary tuberculosis. If we study this phase of the question a little more closely the results are even more startling.

Basing our results upon computations from the registration area for 1906, we find that between the ages of 35 and 39 one man out of 48 and one woman out of 13 will die of cancer; between 40 and 44, one man out of 28 and one woman out of 8; between 45 and 49, one man out of 20 and one woman out of 6; between 50 and 54, one man out of 14 and one woman out of 5; between 55 and 59, one man out of 12 and one woman out of 6; between 60 and 64, one man out of 12 and one woman out of 7; between 65 and 69, one man out of 12 and one woman out of 8.

It may be asked, as cancer is a disease of middle and advanced life, is there much to be gained in saving life outside of sentimental reasons, as the tenure of life would be short at best. We find that the expectation of life at 35 years is 31.78 years, at 45, 24.54 years; at 55, 17.40 years; at 65, 11.10 years, and at 70, 8.97 years. Taking the expectation of life at various years we find for the number of people who died of cancer in the registration area in 1906 between the ages of 35 and 70 a total saving of life, had they been cured of their disease, of 373,574 years. Allowing 20 cents an hour for 300 working days a year this means a loss of $224,144,400 in one year for one-half the United States.

The population for the registration area for 1900 for males and females over 35 years of age was: males, 4,933,424; females, 4,767,304.

If the death rate already given for this period of life would hold true and not increase, as it is most likely to do, out of this immense number of people living at that year 281,909 men and 518,185 women have or will die of cancer. Surely cancer is a problem that is worthy of every effort that can be made for its control.

With the increase in cancer mortality and decrease in that of consumption it is only a question of a short time before the foul plague will displace the white plague as the great scourge of the world. If the present increase in cancer mortality and decrease in phthisis mortality be maintained the deaths from cancer will equal the deaths from consumption in the registration area by the year 1931.

Many places in the United States have already reached the point where cancer kills more than tuberculosis of the lungs. It will not be necessary to go out of our own State to find verification of this fact. Thus: The corresponding death rates for cancer and consumption for 1906 for certain counties and cities in Pennsylvania were as follows:

	Cancer	Consumption
Butler County	72.	72.
Forrest County	31.8	31.8
Montour County	81.2	81.2
Potter County	48.1	25.5
Tioga County	93.3	65.7
Union County	103.1	103.1
Wyoming County	72.6	72.6
Bradford City	78.4	78.4
Carlisle (whites)	73.4	62.9
Hazleton	57.1	38.
Meadville	110.5	85.
Oil City	81.8	81.8
Pottsville	102.	96.
Warren	93.9	37.6
Wilkes-Barre	71.5	71.5

Cancer has the highest death rate of any one other surgical condition. No other condition approaches it in any degree. The census of 1906 shows that the combined death rate of the following surgical conditions, being all

that are recorded, is but slightly twice as great as cancer:

Septicæmia, 4.5; malignant pustule, .1; rabies, .2; actinomycosis, etc., .1; abdominal tuberculosis, 6.5; Potts' disease, 1.5; tubercular abscess, .1; white swelling, .8; tumor, 1.1; exophthalmic goitre, .9; tetanus, 3.0; diseases of the eye, .1; diseases of the ear, 1.6; diseases of veins, .6; diseases of lymphatics, .2; diseases of nose, .2; diseases of thyroid, .4; gangrene of lungs, .5; ulcer of stomach, 3.5; hernia, 4.3; intestinal obstruction, 9.6; gallstones, 2.8; peritonitis, 8.2; appendicitis, 11.4; urinary calculi, .6; diseases of prostate, 3.2; metritis, .3; uterine hæmorrhage, .2; uterine tumor, 1.8; other diseases of uterus, 1.5; ovarian tumor, 1.1; diseases of Fallopian tubes, 1.8; accidents of pregnancy, 1.9; puerperal hæmorrhage, 1.1; other accidents of pregnancy, 1.1; puerperal septicæmia, 6.4; phlegmasia, .1; other diseases of pregnancy, 1.6; gangrene, 3.9; carbuncle, .5; abscesses, 1.3; diseases of bones, 2.6; diseases of joints, .2; amputations, .1; fractures, 7.5; dislocations, .1; burns and scalds, 8.7; gun shot wounds, 2.6; injuries by machinery, 1.4; injuries in mines, 3.7; injuries on railroads, 17.3; injuries on street cars, 3.6; injuries by horse and carriage, 3.7; injuries by automobiles, .4; other injuries, 18.0; a death total rate of 161.5. The death rate from cancer for that year was 70.8, so that the total death rate for surgical diseases was 232.3. This shows that about one-third of all the deaths from surgical conditions were due to cancer.

The total deaths in 1906 in the registration area from typhoid fever for males was 7,904, or one man in 45.3 and for females 5,256, or one woman in 57. In other words cancer kills 1½ times as many men as typhoid fever and five times as many women. The city of Philadelphia alone has in the last ten years expended $27,000,000 for a filtration plant to prevent typhoid fever, and the State millions more to prevent pollution of streams for the same end. Epidemics, such as at Butler, Pa., are heralded broadcast in the newspapers, and the press is waging an active campaign in the education of the public looking toward the prevention of the disease, and yet cancer, which exacts a far greater toll, is apparently without public significance. Every means within the power of the Government is being used to stamp out and prevent such diseases as typhoid fever, malarial fever, smallpox, scarlet fever, diphtheria, plague, and yellow fever, and yet their combined death rate is only 6.4 higher than cancer, and practically nothing is done to master this one great evil.

In the registration area in the years from 1901 to 1906 inclusive, 140,088 deaths occurred from cancer. These were distributed according to the site of the disease as follows:

Cancer of the mouth	4,326
Cancer of stomach and liver	51,398
Cancer of intestines	14,934
Cancer of female generative organs	20,404
Cancer of breast	4,683
Cancer of other and unspecified organs	32,697

The order of frequency being as follows:

	Per cent
Cancer of stomach and liver	36.4
Cancer of other and unspecified organs	23.7
Cancer of female genitals	14.7
Cancer of intestines	10.5
Cancer of breast	8.3
Cancer of skin	3.3
Cancer of mouth	3.0

This table shows that cancer of the stomach and liver is most frequent. To show more specifically the frequency as to site, the following table is given. It represents the percentage of deaths for each organ per 100 deaths from cancer at all ages and for both sexes. Taken from the registration area according to census of 1900:

Site of Disease	Male Per cent	Female Per cent
Abdomen	9.24	7.69
Bladder	2.53	.17
Breast	.75	15.78
Brain	.26	.17
Eye	.24	.07
Genitals	.96	.63
Head, face and neck	10.42	3.14
Larynx	1.08	.13
Liver	14.56	12.59
Lower extremities	.37	.21
Lungs	.61	.51
Mouth, tongue and throat	9.55	1.68
Ovaries		.97
Penis	.39	
Rectum	5.49	3.55
Stomach	43.06	24.47
Testicle	.16	
Upper extremities	.33	.11
Uterus		27.68

This table shows that the stomach is the most frequent site of the disease in man occurring in 43.06 per cent of all cases. In women the stomach is second in point of frequency, occurring in 24.47 per cent of cases, while the uterus is first, being the site in 27.68 per cent of all cases. These figures are at variance with the English statistics, which show a much less involvement of the alimentary tract. According to the American statistics, the alimentary tract was the site of the disease in 81.6 per cent in males and 51.8 per cent in females. The English statistics show for males 70.6 per cent, and for females 43.3 per cent. In the table given above we find that cancer of the uterus and mammary gland comprised 43.46 per cent of all cases in the female.

Statistics show that more women die of cancer than men, but if we eliminate cancer of the organs peculiar to the sex, we find that actually more men die than women from this disease. Thus, taking 1,000 deaths from cancer for males and females, and comparing them for organs which are common to both sexes, the results will show 994.5 for men, and 713.5 for women. Williams has shown that cancer is more rapidly on the increase among men than among women. He states that the death rate from cancer for males (1851 to 1860) was 195 and for females 434, showing a sex ratio of 1 to 2.2; while for the period between 1901 and 1905 it was for males 723 and for females 997, or a sex ratio of 1 to 1.3.

According to the census of 1900 the frequency as to age is given in the following table:

Age	Males Per cent	Females Per cent
Under 1 year	.13	.09
1 year	.06	.01
2 years	.05	.01
3 years	.05	.03
4 years	.06	.01
Under 5 years	.35	.15
5 to 9 years	.16	.11
10 to 14 years	.14	.11
15 to 19 years	.25	.17
20 to 24 years	.75	.43
25 to 29 years	1.05	1.33
30 to 34 years	1.99	3.08
35 to 39 years	3.45	6.04
40 to 44 years	5.80	8.93
45 to 49 years	8.41	11.56
50 to 54 years	11.75	12.28
55 to 59 years	13.12	13.32
60 to 64 years	13.66	12.49
65 to 69 years	13.95	11.26
70 to 74 years	11.31	8.32
75 to 79 years	8.10	5.89
80 to 84 years	3.73	3.11
85 to 89 years	1.46	1.10
90 to 94 years	.49	.27
Over 95	.08	.05

This table shows that for males 63.79 per cent of the cases occurred between the ages of 50 and 75, and for females 60.91 per cent occurred between 45 and 70. The age of greatest frequency for males being 65 to 69 (13.95 per cent), and for females 55 to 59 (13.32 per cent).

In studying this question of age in reference to cancer we must remember that certain factors may alter the table of age frequency, such as conjugal state, site of disease, occupation, and parent nativity. Thus we find in reference to conjugal state the following:

	Years
Single males; age of greatest frequency	45 to 54
Single females; age of greatest frequency	45 to 54
Married males; age of greatest frequency	over 65
Married females; age of greatest frequency	45 to 54
Widowed males; age of greatest frequency	over 65
Widowed females; age of greatest frequency	over 65
Divorced males; age of greatest frequency	55 to 64
Divorced females; age of greatest frequency	55 to 64

The age of greatest frequency in males in different occupations is as follows: professions, 65 to 69; clerical and official, 60 to 64; mercantile and trading, 55 to 59; public entertainment, 55 to 64; personal service, police and military, 50 to 64; laboring and servant, 60 to 64; manufacturing and mechanical, 45 to 75 (the frequency being about the same at all ages during this period of life); agriculture, transportation, and out-door occupations, over 75 years. The frequency as to age is so similar in all occupations that we are forced to believe that occupation in itself plays little part in the causation of cancer. The explanation for the various differences being probably in the average age of individuals in the different occupations.

For females the report is as follows: musicians and teachers of music, 40 to 44; teachers in schools, 45 to 49; stenographers and typewriters, 35 to 39; book-keepers and allied

clerical work, equal distribution between 20 and 60; hotel and boarding-house keepers, 60 to 64; laundresses, 45 to 54; nurses and midwives, 50 to 69; servants, 45 to 59; tobacco workers, 40 to 44; manufacturing and mill operatives, 35 to 59; milliners, 40 to 54; dressmakers, 45 to 49.

The difference in age frequency is probably due to age distribution of the various occupations.

The frequency as to age in reference to parent nativity is shown in the following table:

Mothers born in the United States:
Males, over 75 years.
Females, over 75 years.
Mothers born in Ireland:
Males, 60 to 64 years.
Females, 55 to 59 years.
Mothers born in Germany:
Males, 65 to 69 years.
Females, 55 to 59 years.
Mothers born in England and Wales:
Males, over 75 years.
Females, 55 to 59 years.
Mothers born in Canada:
Males, 50 to 75 years.
Females, 45 to 59 years.
Mothers born in Scandinavia:
Males, 55 to 59 years.
Females, 50 to 75 years.
Mothers born in Scotland:
Males, over 75 years.
Females, over 75 years.
Mothers born in Italy:
Males, 45 to 49 years.
Females, 45 to 49 years
Mothers born in France:
Males, over 75 years.
Females, 60 to 65 years.
Mothers born in Russia:
Males, 50 to 54 years.
Females, 40 to 45 years.
Mothers, colored:
Males, 55 to 75 years.
Females, 45 to 49 years.

This table shows that in the northern countries the age of greatest frequency is practically uniform, while in the southern countries (Italy and negro race) the age of greatest frequency occurs much earlier in life. This is probably due to the earlier period of life at which the races mature.

The age of greatest frequency in reference to the site of cancer is shown as follows: Abdomen, males 60 to 64, females over 50; bladder, males 60 to 70, females 50 to 60; brain, equally over 20 for both males and females (the number of cases is so small that the statistics are valueless); breast, males equally over 40, females equally over 45; eye, males and females equally over 20 (number of cases very small); genitals, males 60 to 75, females 60 to 64; head, face, and neck, males and females equally over 75; kidney, males 45 to 49 and over 75, females 55 to 59; larynx, males 60 to 70, females very rare; liver, males 60 to 70, females 55 to 65; lower extremity, males and females equally after 40; lungs, males 50 to 54, females 50 to 65; mouth, tongue, and throat, males 55 to 59, females 65 to 69; ovaries, 45 to 60; penis, after 40; rectum, males after 55, females 55 to 59; stomach, males 55 to 69, females 60 to 64; testicle, after 20; upper extremity, males after 20, females after 40; uterus, 45 to 49.

It will be seen that with the exception of cancer of the brain, eye, penis, testicle, and upper extremity, the age of greatest frequency is distinctly in accord with the table already given in reference to cancer in general, as it relates to the sexes. It is probably du to the fewness of the cases in those sites which show an earlier age frequency, that this apparent variance is due.

THROMBI AND EMBOLI — POST-OPERATIVE IMPORTANCE

By HUGH CROUSE, M. D., El Paso, Texas

ONLY too frequently the surgeon, be he general or special, undervalues the morbidity or mortality risk of an operation to a patient. Modern methods, covering preoperative care and operative technique, conscientiously carried out, often lead an experienced operator to be over confident as to results, whereas a few days may bring complications and resultant regrets. No complication arising in a clean surgical case can lessen a reputation or bring surgical remorse like the development of a thrombus or embolus during convalescence.

The subject of thrombi and emboli is of interest not only to the surgeon, for the internal medicine man, the obstetrician, the medical gynecologist, and ophthalmologist equally meet their share of infectively induced thrombi in the course of their work. The importance of this circulatory trouble is daily becoming recognized as a more and more frequent factor in the production of pulmonary troubles such as post-operative pleurisy, pneumonia of the lower lobes, and in infectious fevers this complication will, doubtless, ultimately be shown to be the true etiological agent of typhoid-pneumonia, and will also explain some of the complications of tuberculosis, influenza, scarlet fever, and measles.

Sonnenburg, in reviewing his report of emboli after appendectomies, stated that after years of observation he was convinced that after many laparotomies inflammatory processes occurred, which had few symptoms, and that wide-spread pneumonias and severe pleurisies frequently were of embolic origin.

In the New York Medical Journal, February 10, 1906, Abbott says that: Preoperative existing thrombi are frequent explanatory causes of post-operative complications such as fatal sepsis, pulmonary emboli with their necessary lung changes, and so-called ether pneumonia.

On page 173, vol. 4, 1902, American Medicine, G. B. Miller concurs in Abbott's assertion, and states that most of the so-called pleurisies which follow abdominal operations are due to emboli of medium size. If these assertions are correct, the etiology of such a complication should be intensely interesting, not only to the surgeon but to the internal medicine man, who refers his surgical work. There are various factors in the production of thrombi.

Hunter, in 1793, really was the first to attempt elucidation of thrombi development, by advancing the theory of changes in the blood itself as the cause.

Virchow, in 1846, added mechanical agents, tumor pressures, and other obstructive influences to Hunter's theory.

Brucke, 1857, vessel-wall changes. And thus, step by step various agents of thrombi development were elucidated, until Welch, in Allbutt's System of Medicine, added infection.

Recklinghausen advanced an additional theory; viz., the whirling stream, where vessels such as the superficial and deep epigastric, which enter the long saphenous and external iliacs, and the cerebral veins which empty into the longitudinal sinuses, do so at a right or obtuse angle, thus favoring clotting.

Other modern men have added their quota to the elucidation of this many-factor produced complication of diseased states: Welch's toxine, increasing the coagulation of the blood; Osler's and Hayem's theory of changes in the inner coat of the vessels and increase in blood platelets — which occurs in secondary anæmias of cachectic septic conditions, and also after considerable loss of blood. Duncan and Illman (New York Medical Journal, December 21, 1907, page 1168) suggested the body juice theory. These two men in a series of experiments, well carried out, seemingly conclusively proved that the mixing of the body juices with the blood stream is a potent factor in thrombi development; the body juices enter the circulation through absorption in anæmic, cachectic, high febrile conditions, and water-starved pre- and post-operative periods. This element is found to increase the coagulability of the blood. Durshen gives blood changes and traumatism; Clarke, traumatisms of the deep epigastric

arteries and veins, especially by retractors; Wright and Knapp, in their typhoid fever blood work, give an excess of calcium salts in the blood as a potent agent; Boise (Surgery, Gynecology and Obstetrics, July, 1906) concurs in this opinion; Haward, in his recent Huntarian lectures, claims retarded blood flow as a frequent predisposing thrombus cause, and says: "In most cases diminution in the velocity of the blood flow is the proximate cause of thrombosis." Kraehl (Clinical Pathology, page 132), excess of fibrin ferments in the blood in chlorotic states; Vasquez, infection; Lenander, sepsis and pressure from abdominal bandages and fæcal matter in the sigmoid, explaining the major portion of thrombophlebitis of the femoral and crural vessels; Schinck, ether and surgical positions; Morley (Surgery, Gynecology and Obstetrics, September, 1907, page 299) says there is no tenable explanation, and quotes Coe to strengthen his assertion, but believes blood changes, mechanical disturbances and lesion of vessel walls to be the main elements of thrombotic development; Frazier (Keene's Recent Surgery, vol. 1), sepsis most potent factor; Fowler, in his Surgery, 1906, says slow blood current; Mayos, low blood pressure and prolonged stay in bed; Murphy, Ries, Boldt, Chanler, Currier, Gordon, and Brothers concur in Mayos' opinion; Krusen, hæmorrhage; Kelly, recent work on Gynecology, sepsis through the excitation of endophlebitis and endarteritis, and these in turn produce thrombosis. He elucidates his theories as follows: "The infection of the intima of a vessel may occur in one of two ways. The vessel may be involved in an inflammatory process and the organisms which are the cause of the inflammation invade the external coats, and then by way of the vasovasorum or the lymphatics gain access to the intima; or next, and more frequently, the bacteria enter directly from the circulating blood by capillary absorption. He also lists prolonged pressure of pelvic tumors, anæmia by marasmus and carcinomatous changes in the circulation. Tabor Johnson (Surgery, Gynecology and Obstetrics, July, 1906) gives traumatism, as well as sepsis, as a factor, and in proof of the latter reports Steiner's 41 cases, subsequent to pneumonia; Davis, in a paper read before the American Gynecological Society, gives pre-existing infection, altered condition of blood serum, lesion of vessel walls, and mechanical violence. Dearborn (Annals of Gynecology and Pediatrics, November, 1904), in reviewing the work of 25 Boston surgeons, gives the traumatisms of operations about the pelvis. Frankel, in a paper before the German Surgical Society, reviewed in the June, 1908, number of the International Journal of Surgery, page 201, distinguishes between two forms of post-operative thrombi: first, that involving veins of the operative field and due to septic infection of the wound; second, thrombi of remote parts. He says that this points to a faulty technique, which anæsthesia does not explain, for this condition arises when spinal and local anæsthesia has been used, and as the condition occurs during convalescence, it is too late to be an element in its development. He also says that heart troubles do not explain its occurrence, on account of the rarity of thrombi in diseased heart cases. According to his view, it bears the same relation to operation as post-operative perotitis, now accepted as septic. Arthus and Pages say that an excess of calcium salt in the blood is essential, for without it fibrin cannot be formed from fibrinogen. Alexander Schmidt, who devoted a lifetime to the study of the agency producing blood coagulation, concluded his life's work with three postulates, explaining its occurrence: first, that peroglobulin and its derivative, fibrinogen, produced fibrin; second, a special ferment, fibrin ferment or thrombin, produced the changes in the above proteids; third, that a certain amount of neutral salt is needed for precipitating the fibrin into an insoluble form. Hektoen mentions Pekelhering's theory, modified by Lilienfeld, that from blood plasma is derived a neucleo-albumen, which, if brought into solution with fibrinogen and calcium salts, will form a typical clot. The fibrin ferment of Schmidt is a neucleo-albumen calcium compound, and only needs fibrinogen to produce a blood clot. The two last exist in the circulating blood, and the neucleo-albumen is derived from cell absorption, blood plate and leucocyte disintegration. This latter substance is, no doubt, the body juice of Duncan and Illman; the blood plates, the Osler and Haymen point

in elucidating thrombi formation. And so, despite a multitude of theories, seemingly at variance with each other, we have simply several factors working together, or in some cases only two or more factors need be present to give us this much dreaded complication in post-operative surgical cases. Cordier asserts that neither local sepsis nor injury can alone account for thrombi formation; that anatomical causes determine their location, the general cause being the condition of the blood, and that many other elements are necessary to explain the large proportion of cases in surgical work. This theory is concurred in by Baldy. Under aseptic conditions one can double ligate a blood-vessel and the blood-filled lumen will remain fluid (Brucke and Baumgarten); Freund's experiment — that a vaseline coated glass container will retain blood in a fluid state — points to the endothelial roughening of a vessel wall as a factor in thrombi formation; the debility secondary to snake bites, large burns, extensive injuries, and conditions of great exhaustion, point to the body juice theory of Duncan and Illman, and the neucleo-albumen theories of Pekelhering-Lilenfeld. These last few theories, weighed together with the fact that thrombosis occurs most frequently in those parts of the circulatory system in which the movement of the blood is subjected to the greatest disturbances; viz., in the systemic veins and in the recesses of the cardiac cavities (the auricular appendages and between the muscular trabicula of the ventricles), according to Hektoen, are the most tenable explanation of thrombi development. Hektoen's American Text-book of Pathology gives the best classification, and one which really covers all opinions to date:

1. Thrombosis from adhesion (*a*) on foreign bodies; (*b*) on the inner surfaces of vessels, the seat of necrosis, fatty degeneration, or inflammation.

2. Thrombosis from stagnation (*a*) from local disturbances, from ligation, compression, circumscribed dilatation; (*b*) from general circulatory weakness.

3. Thrombosis from fermentation (*a*) due to destruction of blood corpuscles; (*b*) due to the introduction of ferments formed outside of the vessels.

The elements that enter as seeming factors in the creation of thrombi give the color from which the various types derive their names. According to the proportion of blood plates, leucocytes, and red corpuscles, thrombi are classified as white, red, or mixed; between these there may be intermediate forms, as the quantity of each of these forming elements varies.

The white thrombus develops most frequently in the arteries and cardiac cavities, and is the Schimmelbush theory of marginal location of leucocytes, and blood plates organizing about a roughened intima or injured area, and thus the neucleus of a white thrombus is created. When this thrombus extends into the blood stream accretions of red cells occur as it approaches nearer and nearer the axis of the stream, when we have the mixed thrombus. In stagnating or quiet blood, when the conditions are favorable for its development, as in systemic venous areas, the red develops. In the capillaries and smaller vessels, the first receivers of the body juices, in marasmic and cachectic conditions, the hyaline type of thrombus forms. The latter form is, no doubt, a true fibrin, as it reacts to the Weigert fibrin method.

Thrombi retain their original form a brief time only. Five chief changes occur in their structure: hyaline and granular transformation, substitution with connective tissue, calcification, simple softening and septic disintegration, or transferred as a mass or part into a near or distant vessel as an emboli. (Hektoen.)

Emboli pass through the same changes as though they remained thrombi, when derived from that source. An embolus is the impaction in some part of the vascular system of undissolved material, carried by the blood stream. (Welch.) An embolus may consist of a portion or an entire thrombus, tissue fragments, fat globules produced by traumatisms to the superficial adipose tissue, ruptured bone marrow in fractures, acute and chronic osteomyelitis, laceration of the liver, fatty degeneration of thrombi and vascular linings.

Other causes of emboli are placental cells, giant cells from bone marrow, tumor cells, animal and vegetable parasites, foreign bodies, as air, especially atmospheric air, gaining entrance through a vein accidentally opened

during a surgical operation about the thorax, thus permitting the aspiration of air through negative venous pressure during inspiration. (Senn's Experimental Surgery, 1888.)

As a rule emboli follow the blood current, but there are exceptions. A patulous foramen ovale or intraventricular septi of the heart wall permit their passage from one blood stream to the other, thus producing the crossed embolus.

Two types of emboli present themselves for consideration — the bland and metastatic. The bland only produces mechanical effects; the metastatic gives mechanical, bacterial, and malignant effects to the area entered, according as to whether the emboli contain an infective agent or a malignant particle.

The mechanical occluding effect of an embolus in an end artery, like the pulmonary, hepatic, splenic, renal, and the superficial blood-vessels of the brain, is first anæmia of the area, then necrosis and tissue death. Should the embolus be small, and be disseminated to the smaller vessels of an organ or part, then metastatic abscesses occur, so frequently seen in emboli arising in and coming from a distant purulent foci.

As a rule thrombi develop in the direction of the blood stream. The frequency of thrombi is of importance in prognosing contemplated surgical work, and is of importance to the medical man in weighing the complications that may arise, and thus account for delayed convalescence in infectious cases.

In The University of Pennsylvania Bulletin, July, 1902, Clarke reports 41 cases of thrombosi in 3,000 laps (Albanus, Beitr. z. Klin. Chir., vol. xl), 53 cases of venous thrombosi in 1,140 laps; Morley (Surgery, Gynecology and Obstetrics, September, 1907), reports 11 cases in 1,756 laparotomies, and plastic operations performed in the Michigan University Hospital; Reuben Peterson reports 6 femoral thrombi in 3,000 operations; Sonnenburg, in 1,000 appendectomies in a general hospital had 17 cases, with thrombi and emboli as a complication. In 260 private cases the same complications occurred 19 times. Schenck reports 48 cases in 7,130 gynecological cases. Gerster in 1,180 appendicitis cases had this complication occur nine times; Langfeld, in 112 appendix cases, saw pyelophlebitis four times; Fitz, in 257 appendectomies had thrombotic involvement of some vessel and liver abscesses occur 11 times; Gebele in 1,196 laps had this complication 14 times; Burkhart in 236 myomectomies had 12 cases; Pietizikowski in 210 incarcerated hernia cases had 14 cases of pulmonary emboli; Halstead in 131 appendectomies had 4 cases of femoral thrombophlebitis.

In my work during the last five years, in 526 capital operations, I have had thrombophlebitis occur once, in both femorals in a double salpingectomy for pus tubes; a pulmonary and cerebral emboli in a retrocolonic located abscess of appendiceal origin; mesenteric emboli of the smaller vessels of the transverse colon and ilium in a suppurative appendicitis case; pulmonary emboli in two liver abscess cases; a mesenteric and subclavian emboli in a diffuse cervical abscess, secondary to a peritonsillar abscess; and a non-operated upon ruptured ectopic gestation case, dying forty hours after the rupture of tube, from cerebral and pulmonary emboli.

With my cases added to those which I have been able to collect from every source, where the number of cases operated upon were given in reporting the number of thrombophlebitis or emboli complications occurring, we have a summary of 21,134 operations of all kinds, with thrombophlebitis or emboli occurring in 232, giving a per cent of 1.1. Four of my cases died.

Hirst, quoted by Tabor Johnson, claims that thrombophlebitis occurs in three per cent of all laparotomies; Zurhelle, before the Gynecological Section of the German Association of Scientists and Physicians, reports after myomectomy cases operated upon in the Gynecological Clinic of Bonn, 2.75 per cent.

The diagnosis of thrombophlebitis or emboli varies, of course, with the region involved. The regions involved, according to Robinson, where emboli occur post-operatively are, relatively, first, pulmonary 70 per cent; second, renal 12 per cent; third, splenic, 8 per cent; fourth, hepatic, 5 per cent; fifth, cerebral, 4 per cent; sixth, serous membranes, pleura, peritoneum, joints, etc., 1 per cent.

Within the lung, should the involvement be that of the pulmonary artery and the embolus

large, the patient complains of precordial distress, severe chest pains and dyspnœa, associated with a quickened pulse, expression extremely anxious, patient gasping for breath, using all of the auxiliary respiratory muscles, face cyanosed, extremities bathed in cold, clammy sweat, mind clear as a rule, death within one to twenty minutes. Should the emboli be small and numerous, atelectasic changes, metastatic abscesses, and gangrene occur, varying, of course, in their development with the agent forming the emboli.

Kelly, Gynecology, 1906, says that emboli of the pulmonary arteries stand in close relationship to thrombi of the pelvis and crural vessels. This artery, deriving its blood as it does, from the entire system through the right heart, the source of its embolic occlusion, must necessarily be varied with the near or distant region from which the embolus is derived.

Miller, in American Medicine, 1902, vol. 4, page 173, says that many of the so-called operative pleurisies are of embolic origin.

Abbott speaks of the same cause for many post-operative pneumonias.

The occlusion of the renal artery by a large embolus will, of course, lead to the destruction of the kidney, with the usual symptoms of sepsis, temperature, pus in the urine, leucocytosis, iodophiliac blood changes, and necessitates surgical interference.

When the emboli are small and numerous, the signs, according to Simon, Israel, Harrison, Welch, and Miller, are pain, tenderness in the renal region, blood in the urine, leucocytosis, pus, and other symptoms of suppurative nephritis.

The condition is most generally unilateral, according to Brewer and Johnson, particularly attacking a kidney that is displaced, or cystically, calcareously or traumatically diseased. The type of emboli involving the kidney is one most generally derived from the heart or aorta, and, in consequence, is an infective kind of infarct.

Emboli locating in the spleen have not been studied as thoroughly as those in the organs just mentioned. Litten says that emboli not infrequently lodge in the spleen, leading to its hypertrophy, and that in small and numerous infarcts abscesses appear with their usual subjective and objective signs of pus somewhere in the system. Litten ranks splenic emboli with renal as to origin of emboli and frequency of cardiac and aortic sources.

Ziemssen ranks splenic involvement next to renal infarct involvement.

Litten, in 35 cases of sepsis ending in death, at post-mortem found large tumors of spleen in the 35, and in 14 of these multiple abscesses.

The frequency of suppurative changes in the liver, especially in septic appendicitis cases, has led me to carefully list every case securable that could justly be classed as having derived its infection from an appendiceal source.

Gerster reports 9 in 1,180 cases.

Quincke, Nothnagle's Encyclopædia, lists appendicitis as second only to dysentery as a cause for liver abscess, and chololithiasis as third.

Langfeld in 112 cases of appendicitis had pyelophlebitis of the portal blood supply four times.

Fitz in 257 cases had liver abscess in pyelophlebitis eleven times.

Sonnenburg, in 1,000 cases had this complication twice.

Albanus had three cases.

H. A. Beach says he has seen emboli inducing liver troubles in appendicitis cases more frequently than in any other surgical condition.

Kelly speaks of the frequency of subphrenic and liver abscess development in suppurative appendicitis, devoting several pages of his text on appendicitis to its pathology, symptoms, and treatment.

Monroe, 1905, Annals of Surgery, mentions liver and subphrenic abscess, originating from septic emboli of an appendical order.

It is not to be inferred from the points above given, that appendical conditions are the only source of embolicly induced hepatic pyelophlebitis or abscess. Resection of the intestines, gastroenterostomies, operations for incarcerated hernias, volvulus, intussuseption, thromboses of the mesenteric veins are also sources of post-operative liver changes of an embolic nature.

Miller, in the September, 1907, American Journal of Obstetrics, page 347, says it is possible that the high, irregular pulse rates, so often noted in femoral thrombi is due to small

emboli passing through the heart, and that in sudden death in such cases the coronary artery should be examined. There is no doubt but that the heart is the seat of thrombotic and embolic involvement in post-operative cases more often than has heretofore been conceded.

The development of endocardial, myocardial, and pericardial conditions, appearing post-operatively, are frequently of thrombotic and embolic origin. The involvement of the brain is of peculiar symptomatic interest, on account of the hemiplegic condition that arose in two of the six thrombi-emboli cases occurring in my practice. In each of these cases the cerebral embolus was complicated by subclavian infarcts. In each the onset was sudden, one pupil contracted, the other dilated; respiration shallow, hurried and slightly variable, ranging from 22 to 42 per minute. Patients in deep stupor, seemingly could not be aroused; calling to caused one patient to move uninvolved hand; head turned to right in one case, in other to left; eyelids partly open, now and then slightly twitching. Atropin given by hypo gave reaction in one eye and not the other. These symptoms, of course, would vary with the cerebral area involved.

As to the vessels most frequently involved in embolic conditions, it would be safe to list the pulmonary artery as first in liability. Standing as it does at the gateway of all returning blood from the entire system, it necessarily is the recipient of all emboli of venous origin.

Newton Pitt, Transactions of Pathological Society, London, volume 44, page 48, records 40 cases of pulmonary thrombosis in 3,218 autopsies.

Robinson claims 70 per cent of emboli to be ultimately pulmonarily located.

Ranking next to the pulmonary, the list of cases that I have reviewed shows involvement of the femoral veins to be next.

The left external iliac vein, on account of its anatomical situation, is subjected to the pressure of a loaded sigmoid or rectum, as it passes behind the right common iliac artery, it is necessarily occluded in part, and thus is influenced not only by these pressure effects, but together with the right femoral vein, is equally liable to thrombotic infarcts, through the entrance of the blood stream from the epigastric veins into the femoral at a right or obtuse angle (Recklinghausen) thus giving rise to an eddying motion of the blood. This whipping effect to a blood susceptible to coagulation practically explains the frequency of such post-operative complications in this region.

Bosher, of Richmond, in his article on thrombophlebitis as a complication in post-operative work, recites 7 cases.

McMurrich, quoted by Morley, in 150 autopsies has found that the left iliac vein at or near the bifurcation had an adhesion extending from the anterior to the posterior wall in 48 cases, or 33⅓ per cent.

In many cases the vessel lumen is divided into two channels.

As to the side involved, in Clarke's series of 41 cases it occurred in the left 25 times; the right 11 times; in both sides 5 times.

Willy Meyer's two cases: left leg first, then right, in both of them.

Vanderveer, left side, 4 cases.

In one of my six cases, both sides.

In literature there is but a small percentage of reported infarct cases that deal with the involvement of the splenic, renal, or cerebral vessels. Robinson's relative list, 12 per cent renal, 8 per cent splenic, and 4 per cent cerebral, really covers the importance of involvement of these vessels.

Thrombophlebitic complications, involving the various sinuses contiguous to the ear, met with by the aural specialist, should be properly included in cerebral cases. Dench, in his text-book on the ear, page 467, in speaking of thrombi formation in middle ear troubles, says this should be borne in mind as one of the possible complications of acute and chronic suppuration within the tympanum. A thrombus may remain localized within the sigmoid sinus itself, affecting but a small area, or it may extend to the internal jugular vein. In certain cases one may have an involvement of the lateral and petrosal sinuses, and through the latter an extension to the cavernous sinus with all of its possible ophthalmic complications.

Dench further remarks that it is interesting to note that the primary aural affection and the primary sinus thrombosis may cause secondary thrombosis, secondary purulent deposits through emboli in various organs of the body,

and even brain abscesses upon the opposite side.

In Burgman's System of Surgery, page 290, Schlatter says there are three places in the human organism in which venous blood has a tendency to become coagulated: in the intracranial sinuses, in the true pelvis, and in the lower extremities. The anatomical peculiarities of the cerebral sinuses, their wide lumen and stiff walls, and the fact that the cerebral veins empty into the longitudinal sinuses at a right or obtuse angle, make them peculiarly liable to thrombotic involvement.

The starting point of an infectious thrombosis may be infected wounds of the soft parts and bones, erysipelas of the face and head, severe infections in the region of the head, or the orbital, buccal, nasal, and pharyngeal cavities. Thus, anthrax of the lips, the mouth, the nasal and orbital cavities, periostitis of the jaw from caries of the teeth, inflammation of the tonsils, and retropharyngeal abscesses have been described as etiological factors.

But the most important starting point (Korner) is the ear, this organ furnishing two-thirds of the cases. Hessler, in a study of 81,648 ear cases, found sinus phlebitis in 116 cases. As a result of this, 34.5 per cent or 40 cases died of meningitis; 24.1 per cent or 28 of these developed cerebral abscess; 41.4 per cent or 48, sinus phlebitis.

Pitt, in 9,000 autopsies, made in Guy's Hospital, found that 57 of these died from ear suppuration, 22 of whom had otitic sinus disease.

The male is affected six times as often as the female. Like all aurally induced cerebral diseases, the right side is more frequently involved. There is an explanation of this, in the broader, deeper and more superficial location of the right sigmoid fossæ. There is also a greater flow of blood from the right than left; on this side the longitudinal sinus generally empties into the transverse sinus. This is explained by the shorter and straighter course that the greater portion of the cerebral blood takes in seeking the heart.

The portal blood supply is susceptible of involvement in 5 per cent of all infarct cases, and is of peculiar interest on account of its intimate relationship to the next group of vessels involved in embolic movements, viz., the mesentery. These vessels are of peculiar interest to me, on account of the fact that two of my six infarct cases have been occlusion of one or more of these vessels. In consequence of this fact, I shall enter more extensively into the symptomatology of mesenteric involvement than that of any other vessel.

Through the classic, much-quoted paper of Jackson-Porter and Quimby, appearing in the June 4, July 2, July 9, and July 16, 1904, numbers of the Journal of the American Medical Association, the importance of the involvement of these vessels has become known. From various sources they collected reports of cases, adding several of their own as well as colleagues to the summary, totaling 214 cases. In 197 of their cases 61 or 12 per cent were arterial, 39 venous.

Korner states that blockage of the arteries is five times more frequent than that of the veins, and that the superior artery is 40 times more often the seat of infarct than the inferior.

As an explanation of this latter fact, Litten says that, functionally, the superior mesenteric is an end artery, and that failure in the development of a collateral circulation after occlusion of this vessel is due to the fact that the establishment of a collateral circulation needs a higher blood pressure than the blood of the body can reach. (See Fig. 1.)

Faber says that the infarction is due to back pressure of blood in the portal system, which overcomes, and is greater than, the pressure in the anastomosing vessels. He explains the reason why the inferior mesenteric artery does not take up the work of the closed superior artery by stating, that it is a smaller vessel and cannot suddenly assume the functions of a larger one. Further, after closure of the superior mesenteric artery, the pressure in the superior mesenteric vein necessarily sinks to *nil* immediately. The pressure in the portal system is thus lowered, making the flow from the inferior mesenteric vein easier. It is thus easier for the inferior mesenteric artery to flow by its natural channel. (See Fig. 2.)

The intestinal contractions induced by fermentative intestinal contents co-operate with the above physiological currents in preventing the collateral development. The cases of Kar-

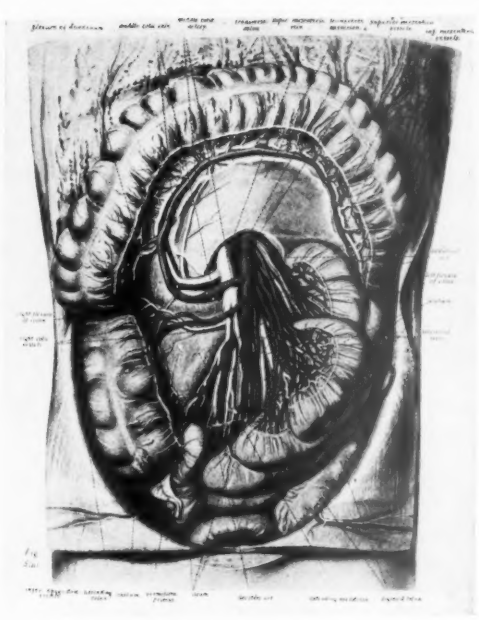

Fig. 1. From Sobotta – McMurrich.

Fig. 2. From Sobotta – McMurrich.

cher, Chiene, Cohn, and Virchow confirm the fact that collateral circulation does occur. The routes: *colica sinistra* Karcher's case; the superior hæmorrhoidəl, colica dextra and sinistra, retroperitoneal plexus of arteries, and through the latter, the internal iliac and mesentery (Chiene); pancreatico-duodenalis and inferior mesentery (Virchow).

The causes of mesenteric infarcts have been proven to be as follows: Endocarditis, arteriosclerosis, artheroma of the aorta, intestinal putrefaction, appendicitis (Porter-Jackson and Quimby). Sclerosis of the mesenteric vessels (Becket); primary thrombosis (Gerhardt); lattice work endartaritis (Litten); surgical infections, puerperium, typhoid fever.

In Central. der Med. und Chir. Jenna, (Neutra) summarizing 120 cases gives from five to ninety years as the ages in which this complication occurs; majority past middle life. Porter-Jackson and Quimby, 64 per cent in men; 36 per cent in women. Mortality of reported cases 94 per cent.

The symptoms of this complication are: Given a case with a thrombus already existing in some part of the body, from whence an embolus may arise, patient attacked suddenly with abdominal pain, persistent and paroxysmal in nature, accompanied by vomiting, first of the stomach contents, later stercoraceous matter, and in some cases blood, gradually increasing abdominal tenderness and distention, with a palpable tumor, stools diarrhœal and finally bloody; temperature subnormal or normal, signs of shock, sudden in onset, hiccough, intestinal obstruction, marked increase of leucocyte count, and positive iodine blood reaction, sugar suddenly appearing in the urine (Tangle, Kolish, and Harley); increased elimination of indoxyl, at times signs of nephritis, and you have the salient points of mesenteric emboli.

Kussmaul and Gerhardt claim that bloody stools are essential; Deckert, Neutra, Jackson-Porter and Quimby oppose, claiming that bloody stools only occur in 41 per cent of cases, constipation in 22 per cent, diarrhœas without blood 13 per cent, normal stools, 12 per cent.

To the 214 cases reported by Jackson-Porter and Quimby, I wish to add Mignon and Dop-

ter's case of mesenteric vein involvement, reported in the Presse Medicale, October 26, 1904; one case reported of mesenteric artery thrombosis in a woman, aet. 68, in the May 6, 1905, number of the Roussky Vratch. Ritterhaus, 2 cases, one of inferior mesenteric artery, and one of superior mesenteric artery reviewed in the October 27, 1906, number of Journal of American Medical Association.

In the Deutsche Zeitschrift, October 5, 1907, Brunner reports one case of superior mesenteric artery, man 62, operated on, recovered; mentions 89 other cases, 31 operated upon, 4 recovered.

Also my two cases, reported in the latter part of this article, totaling 221 cases.

In general the treatment of thrombi and emboli should be prophylactic, if possible.

In Archiv. fur Gyn., 1908, vol. 56, page 218, Singer says that thrombi are indicated in surgical cases by a pulse acceleration, unaccompanied by fever, several days before œdema and cord-like vessels occur, and that the pulse rate remains high after the temperature returns to normal.

Wyder, Richter, and Muhler concur in this opinion, which is opposed by Clarke. Richter (Arch. fur Gyn., vol. 74, page 1) says that in 63 per cent of his cases the pulse rate warned him of the thrombotic development, and that in 34 per cent he had doubt because of the synchronous fever. Wyder says he no longer undertakes a serious gynecological operation, where œdema and a high pulse rate or other signs of a recent thrombi are present provided the general condition sanctions operative postponement.

Tabor Johnson says, in operating, one should protect the wound from injury by retractors, avoid roughness, much hæmorrhage, retain patient in bed longer, and aid venous return by elevating the foot of the bed immediately after operation.

Boise advocates a careful examination of the heart in all contemplated operative cases, and says: "If the area of dullness is somewhat increased, if the first sound is disproportionately weak, if after exertion the pulse rate is greatly increased, due allowance being made for existing anæmia, if there is a history of chronic exhausting disease, we may justly diagnose heart degeneration, whether we detect any artheroma of the peripheral arteries or not; and, if coupled with these points, a blood test shows an excess of calcium salts with chronic anæmia, we are justified in taking all possible precautions against the occurrence of emboli."

Krusen advocates blood test for calcium salt excess, for leucocytosis, and the presence of blood plates.

If an excess of calcium salts be found, Wright and Knapp, seconded by Duncan and Illman, Boise and Krusen, advocate the use of 36 grains of citric acid t. i. d.; alcohol and large quantities of water.

Richards advocates tobacco smoking.

Haward, alcohol, oxygen, liquid and fruit juices.

Mayos, Murphy, Ries, Boldt, Chanler, Gordon, Currier, and Brothers advocate as a prophylactic agent the early getting up of the patient, upon the theory that the heart contractions are less vigorous in a recumbent posture; that the residual blood from insufficient ventricular action is peculiarly liable to coagulation. All of which is in part avoided by the upright position and physical exertion.

Bosher says the treatment of thrombophlebitis is largely negative, consists of rests, elevation, and cotton bandaging. Patient not to be allowed to make much muscular effort for some time, when it does occur, until after the complete subsidence of all local symptoms. Avoid digitalis; recommends the wearing of elastic stockings for quite a time.

Guiseppe Guicciardi, reviewed in American Journal of Obstetrics, June, 1906, advocated the simple ligation of veins where the infarct occurs in superficial or readily reachable vessels.

Stewart, in Annals of Surgery, September, 1907, reports arteriotomy successfully performed for one thrombi and one emboli case, resulting from contusion.

In speaking of surgical intervention in thrombophlebitic cases, it will be necessary to deal with the special vessels or regions involved. Watson states that in the occlusion of the mesenteric vessels one-sixth of all cases are amenable to surgical intervention. Mudd claims this to be an over-estimate, April, 1904, Interstate Medical Journal.

The treatment of mesenteric infarcts is truly

surgical. Moynihan, Jackson-Porter, and Quimby advocate bringing the involved bowel well out of the abdominal incision, allowing for liberal wound margin after resecting the diseased area, draining the intestines with Paul tubes, fixing the open intestinal ends in the wound, well walled off with gauze. Upon recovery from the primary trouble, an end to end anastomosis.

The pulmonary artery has been successfully operated upon in a calf by Trendelenburg. His work was reviewed in November, 1908, number of Surgery, Gynecology and Obstetrics. He reports 9 cases of pulmonary emboli occurring in the Leipzig General Hospital. Two ended fatally in one-half minute; 7 in 10 minutes to one hour. This latter fact suggested surgical intervention. A calf was used, an experimental embolus induced in the pulmonary, the animal operated upon, and recovered. Four months later the animal was killed and the vessel wall was found in good condition. His technique is as follows: Open thorax by transverse incision over second rib, make a vertical incision over left sternal border; pull back the triangular flap resulting, resect second rib next to the sternum for about 10 to 12 cm. out; expose pulmonary vessel, incise artery, compress the ends and extract infarct as rapidly as possible. If more than 45 seconds are needed for the extracting part of the operation, artery must be clamped laterally, the compression of vessel lessened, and the blood stream allowed to flow, then vessel again compressed and search continued. Trendelenburg says that the average 15 minutes that a patient lives with a pulmonary embolus is at the disposition of the operator for surgical intervention.

An attempt to perform the operation on a 70 year old woman ended disastrously.

Infarcts of the long saphenous have been successfully operated upon for years, according to A. Becker, in a paper read before the Association of German Scientists and Physicians, paper reviewed in International Journal of Surgery, November, 1907, page 360. He says that his chief, W. Mueller, for 14 years, in cases of recent progressive thrombosis of saphenous veins, has been doing an immediate ligation of the venous trunks above and below the obstruction, and extirpating the entire thrombosed area. He says this work has been done successfully many times, lessening the morbidity and decreasing the confinement of the patient to 14 days.

Frankel, in a paper before the same society, reviewed in the June, 1908, number of the International Journal of Surgery, decries the operation, saying that surgical intervention is unreliable; does not remove the deeper lying veins which may be affected, and, in consequence of this mechanical treatment, the patient is submitted to an additional risk of emboli.

Following is a brief report of my cases:

CASE 1. Mrs. G., aet. 32, large fleshy woman, with a history of chronic pelvic trouble; was operated upon in Hotel Dieu, November, 1904, for double pus tubes. Case did well until eighth day, when a dissecting stitch hole abscess occurred, rather extensive and severe. Six days later signs of thrombophlebitis of both femoral vessels occurred. Results, slow convalescence; still at this date has œdematous limbs, and is compelled to wear elastic stockings.

CASE 2. E. L., aet. 29, native of France, then lived in Mexico; syphilitic history. Entered Providence Hospital, July 7, 1907, for operation upon appendical abscess. Case operated upon by Kelly retroperitoneal method; abscess diagnosed retrocolonic from referred psoas pains. Patient did well for two days; suddenly had a fit of coughing and became seemingly unconscious. Being called by nurse, I found patient in following condition: Left pupil contracted, right dilated; dorsalis pedis vessels both easily located and countable; respiration shallow, hurried, and slightly variable, ranging from 36 to 42; patient in deep stupor, seemingly could not be aroused; calling to caused movement of right hand, but not of left. Complication diagnosed superficial cerebral and left subclavian emboli. Condition developed immediately after a severe retching spell, followed by coughing. Presumed this to be the inciting cause of embolic movement. Time of development, 11:45 P. M. Time of these notes, 2:30 A. M. Surface temperature of two arms: left cool, practically cold; right, normal. Head turned to right. Eyelids partly opened, now and then slight twitching. Legs and feet warm. 1-100 atropin given per hypo gave results in left eye, practically none in right. Treatment: outside heat and absolute quiet. Death in 8 hours.

CASE 3. This case is a peculiarly interesting one, and, in consequence, I hope that you will pardon the space I allow it. Mr. E. E., aet. 58; American; storekeeper; entered Providence Hospital, September 21, 1907, suffering with a diffuse cellulitis of left cervical area, extending from post-auricular space to clavicle; ill three weeks with tonsillar inflammation and then cellular trouble. Diagnosis, peritonsillar abscess, extending into deep fascia of neck. Area freely incised, muscles and vessels practically dissected out by the suppurative changes. Finger could be passed into

throat from external wound. Patient did well two days, then complained of numbness in left arm; found radial pulse absent on that side, limb cold. Used external heat and quiet. Twelve hours later patient subsequent to taking a glass of milk at 1 A. M., complained of a violent, paroxysmal pain in abdomen; vomited; pain excruciating; nurse called me, and upon my arrival at hospital, found patient vomiting persistently; abdomen somewhat distended, diffusely tender, point of paroxysmal pain slightly above and to left of navel; suspected the milk, but found other patients had been fed with same and no bad results; gave morphine and watched patient. Pains increased in severity, patient in cold perspiration, temperature 96½, pulse 88, bowels moved loose. Temperature 10 hours later, 97⅜, pulse 92, respiration 22, vomiting now and then. At 5:30 P. M. stooled some mucus, no blood; pulse 120, temperature 98.6.

12:15 next day, temperature 98⅘; pulse 122; patient suffering with abdominal pain, abdomen markedly distended.

5:00 A. M. next morning, large pinkish liquid stool; pulse 130; temperature 97⅞; respiration 38.

10:50 A. M. died.

Post-mortem showed emboli of superior mesenteric artery at point between exit of middle colic artery and right colic artery. Bowel from 6 inches below duodenal jejunal flexure to hepatic flexure absolutely black. Arteriosclerosis of mesenteric and other vessels, vegetative cardiac valves, thrombosed left internal jugular.

The first point of interest in this case is the rarity of thrombophlebitic complication in peritonsillar abscess condition.

Ward, in October 14, 1899, number of the New York Medical Journal, page 546, reports two cases occurring in his own practice within 4 months, and one (Rigal, Didelot and Kiemann), reported by Bosworth in his text-book on the nose and throat.

After exhaustive research, this case of mine proves to be the sixth in literature. In looking up the literature of peritonsillar abscess, I found that Coakley does not mention thrombophlebitis as a possible complication of peritonsillar abscess. Ballinger simply mentions it. Ingalls does not mention it. Kyle simply mentions it. DeSchweinitz-Randall do not. Bosworth reports the Rigal-Didelot and Kiemann cases, so that this case is of some interest, not only from the source of the infarcts, but also on account of it having a termination from a mesenteric embolus, another rare condition.

CASE 4. Mesenteric infarction of the lattice work endings of the middle colon, mentioned by Litten, and of the smaller arcades of the ileum.

Mr. P., barber, American, aet. 29. Entered Providence Hospital, June 5, 1908, suffering from a suppurative appendicitis. Appendix found in internal right ring, abscess cavity walled off by abdominal wall, Poupart's ligament and intestines; necrosed perforation of cæcum size of half dollar. Case did well 10 days, then complained of pain slightly to left and above umbilicus. Diagnosed mesenteric abscess. Secondary operation showed dark, infarcted transverse colon, area involved 4 inches, and another area in ileum 15 inches. Operation, double resection; in large bowel, Murphy button; in small intestine, end to end anastomosis with sutures. Patient recovered. This is worthy of comment, on account of the area involved, the recovery, and the fact that the primary foci of infection was so close to femoral vessels, and yet no recognizable infarction of them occurred. I am convinced that this was an involvement of venous supply of the intestines.

CASE 5. A non-operated upon, ruptured ectopic gestation case. Of interest from the fact that the available literature, viz., 250 articles and 60 text-books, special and general, reviewed by me in preparing this paper, do not even mention thrombophlebitis as a possible complication of ectopic cases. Mrs. M., widow two years, aet. 26, illegitimately pregnant. Seen August 5, 1906, in afternoon, suffering from all the classical signs of a ruptured tube; pulseless; denied liability of pregnancy, asserted an unviolated virtue. Careful, persistent stimulation and quiet rallied the patient sufficiently for removal to the hospital the next day. The subsequent morning, while preparing to operate, the patient became suddenly unconscious. Right radial pulse found to be absent; left present. Head drawn to left side, one pupil dilated, one contracted; snoring respiration. Patient died in two hours.

Post-mortem showed belly full of blood, infarct in right subclavian artery, brain not examined. The next point of interest in this case is that she had been operated upon three years before for a suppurating left tube, had a severe sepsis in bed four months, finally recovered. This case I believe due to either an old thrombus or endocarditis, and is a distinct proof of the Duncan-Illman theory of the body juice absorption in severe hæmorrhage.

CASES 6 AND 7. In Mexican men, aet. respectively 27 and 35. Operated upon for large liver abscesses of the right lobe; died on the eighth and twelfth day of convalescence, with typical pulmonary emboli symptoms. Each lived only a few moments.

EN RESUMÉ

1. We have a complication liable in all surgical work in 1.1 per cent.

2. The occurrence of such a frightful accident, after even such a simple operation as ventrofixation, teaches us anew the important lesson that the surgeon is never warranted in guaranteeing the recovery of a patient after a seemingly simple operation.

3. That we should carefully examine the circulatory system of all patients demanding an operation.

4. That operative interference in selected thrombophlebitic cases of the superficial vessels is a rational treatment.

5. That there is no one factor that can

explain a thrombotic development, for such a complication in either a medical or surgical case is due to many different conditions: vessel wall changes, blood changes, anatomical peculiarities of certain regions, mechanical irritations and infected condition of vessel, blood and system.

6. That there is not much that can be done, but there is no surgical state that needs a better common sense treatment than thrombi and emboli.

7. That we are dealing with a condition occurring in the main during convalescence, appearing from the second to the thirty-second day, mean average 14 days. That it is, in the main, a complication arising without warning.

THE EVOLUTION OF OVARIOTOMY IN FRANCE

By PROFESSOR SAMUEL POZZI, M.D., Paris, France

In the October number certain of the legends in Professor Pozzi's article upon the above subject were interchanged. The figures in which errors occurred were the following, and the legends should have read:

Fig. 3. Péan's clamp.
Fig. 5. Serre-noeud of Koeberlé.
Fig. 6. Cintrat's serre-noeud.
Fig. 7. Ecraseur of Guéride.
Fig. 8. Koeberlé's method of treating the pedicle.
Fig. 11. Koeberlé's method of closing the abdominal wall and treatment of the pedicle.

DEPARTMENT OF TECHNIQUE

AN APPARATUS FOR ASPIRATION

A Description of an Apparatus Used at the New York Hospital

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Aspiration has innumerable applications in surgical technique and many devices for utilizing it have been elaborated, notably by Langier, Dieulafoy, Potain, Laurens, and Walker. At the New York hospital the principle has been used rather extensively for the last three years and, as the result of suggestions made by Dr. Frank Hartley, new applications and certain modifications of the usual apparatus have been developed. These will be briefly described:

To produce the required suction we find that the simplest and most practical device is one in which the suction is produced by water or steam on the principle of the Sprengel pump. A serviceable apparatus of this type is the H. D. ejector made by the Hayden & Derby Co., Plate 1, Fig. 1. This model can be operated by water or steam at any pressure over 20 pounds, and may be connected with a water or steam pipe wherever convenient. We have the following connections:

From the operating room a ¾ inch iron pipe, provided with a cock, leads to the engine room, six stories below, where it is connected with an ejector which is attached to the steam pipe. This gives a simple and permanent fixture which is always in working order.

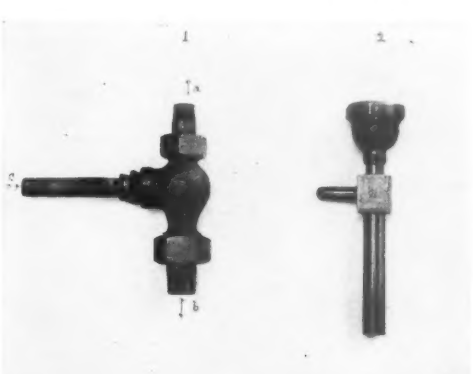

Plate 1. H. D. ejector, Model C, No. 1. 1, inlet for steam or water at a; outlet at b; suction at c. 2, filter pump.

Plate 2. H. D. ejector connected with water pipe over sink in the dispensary. Does not interfere with usefulness of faucet. Tube is here connected with a Bier's cup.

In the dispensary, ejectors are attached to the water pipes over the sink, Plate 2.

For temporary use an ejector or a filter pump is frequently attached to a water faucet. The filter pump, Plate 1, Fig. 2, is smaller than the ejector and can be more easily attached to a faucet. It can be obtained from any of the well-known dealers in chemical apparatus. From the ejector or filter pump, as the case may be, a fairly stiff rubber tube may be led to a receiving bottle at the patient's bed, even at a considerable distance. From this bottle a comparatively short tube extends to the region to be drained, for example, the urinary bladder, gall-bladder, empyema, fæcal fistula, and similar post-operative conditions.

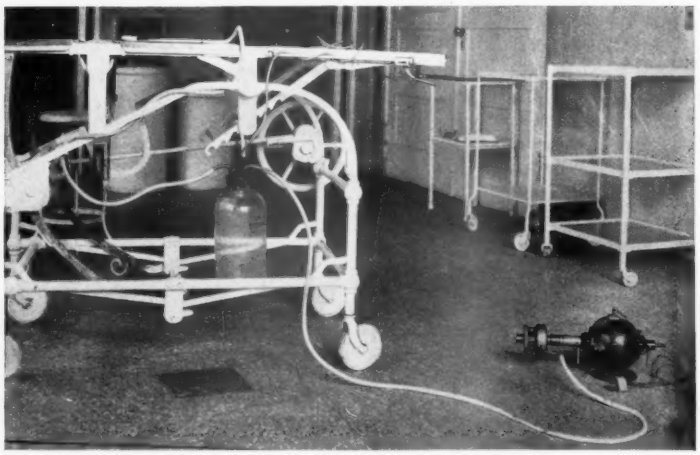

Plate 3. Electric motor and air pump.

As a substitute for water or steam an electric motor and air pump or one of the small vacuum cleaning outfits may be used. Plate 3 shows a motor of about $\frac{1}{8}$ horse-power, with a directly connected rotary air pump. This is thoroughly efficient and portable, but somewhat noisy, and, like all electrical and mechanical devices, requires considerable care.

Applications in the operating room, Plate 4. A stiff, non-collapsable rubber tube (known to the trade as pressure hose) leads from the suction pipe to a gallon bottle under the operating table. This bottle is tightly closed with a rubber stopper, through which two metal tubes penetrate. To one of these the above mentioned rubber tube is fixed; to the other is connected a sterilized rubber tube which extends to the field of operation. The bottle is important, as it reveals at once the amount and character of the fluid aspirated and also prevents soiling the pump and the pipe leading to it. The comparatively short tube leading from the bottle to the field of operation is the only one contaminated and this can be readily cleansed by allowing it to suck up soap and water and then

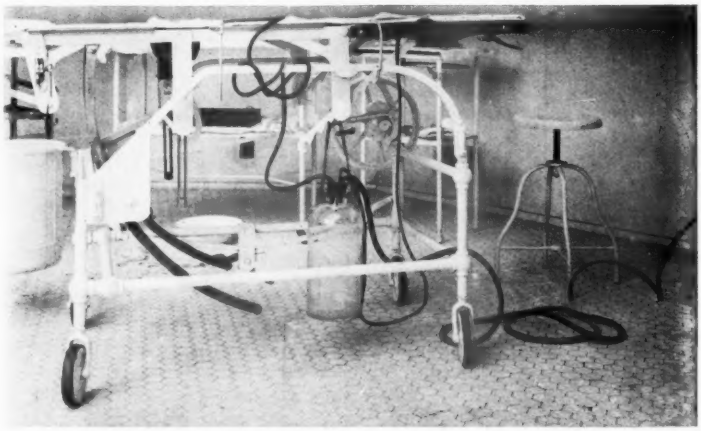

Plate 4. Operating table with large bottle suspended beneath. Stiff rubber tube connects bottle with pipe which is connected with an ejector in the engine room. Two other tubes lead from the bottle to the table top — one for the anæsthetist, the other (sterilized) for the operator.

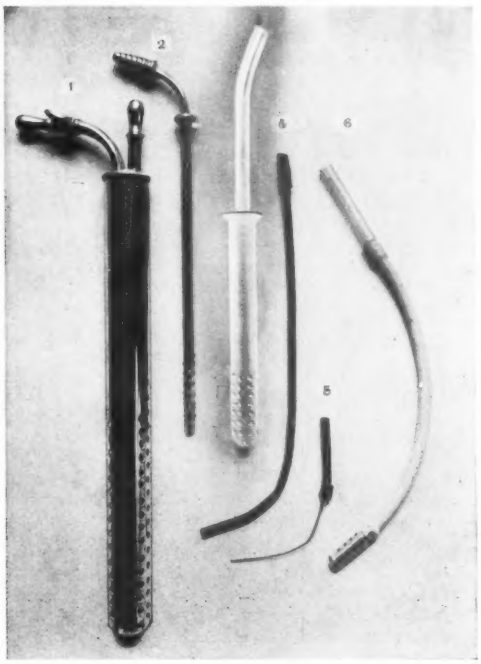

Plate 5. 1, suction irrigator; 2, 3, 4 and 5, suction tips; 6, tip for pharynx (Creevy).

Plate 6. 1 and 2, suction irrigator (disjointed): 3 and 4, suction tip (disjointed); 5 and 6, tip for pharynx (Creevy).

removing it from the bottle and boiling it. If boiled before it has sucked itself clean, blood and pus may coagulate inside and occlude its lumen. During an operation it is very desirable from time to time to immerse the nozzle in a dish of salt solution to wash out all material that might be dried by the air passing through the tube.

A third, smaller tube, may be passed through the stopper or connected with the larger tube by a Y connection to aid the anæsthetist in removing secretions or blood from the throat. For this purpose Dr. Creevy has devised a tip which prevents any cupping action on the mucous membrane and thus protects it from injury and at the same time insures uninterrupted suction, Plate 5, 6, Plate 6, 5 and 6. Of course if both these tubes are being used at the same time neither is as powerful as when one alone is employed; and the other should therefore be temporarily clamped off by the anæsthetist.

One of a variety of appropriate metal tips is attached to the end of the tube in the field of operation. Accumulations of fluid can in a cleanly manner be thoroughly and quickly removed and collected in the bottle. If necessary, irrigation can go on at the same time without the usual sloppy result.

When used in the peritoneal cavity the end of the suction tube may become plugged with omentum or intestine, completely stopping its action and perhaps injuring these structures by the cupping that results. We have devised a tip which obviates this danger, Plate 5, 2, Plate 6, 3 and 4. The outer tube is perforated in numerous places and communicates freely with the atmospheric air by its outer end. It forms a well into which fluids gravitate to be removed by the inner or suction tube which reaches nearly to the bottom. This tip is in almost daily use as a substitute for or adjunct to sponging, enabling one to evacuate quickly accumulations of pus, blood, etc., in abdominal operations.

For the irrigation of the peritoneal cavity we have a tube which, like the last, prevents cupping of the intestines, Plate 5, 1, Plate 6, 1 and 2. It differs from the Blake tube in that suction by connection with the bottle is substituted for syphonage. Irrigation and evacuation can go on simul-

taneously or independently; for the latter purpose the outlet is supplied with a stop cock. The same principle is used with smaller tubes for smaller cavities, e. g., pelvis, appendical abscess, suppurating cysts, etc.

Pieces of seamless tubing, 8 inches to 10 inches long, $\frac{1}{16}$ inch to $\frac{1}{4}$ inch in diameter, made of soft malleable copper, so that they can be easily bent to suit the conditions arising at the operation, constitute useful tips and have been used very successfully by Dr. Hartley as an adjunct to sponging for obtaining a clear operative field, in the removal of the Gasserian ganglion and in brain, nose, throat, cleft palate, and bladder operations. Plate 5, 4 and 5.

Appropriate tubular tips have been used very efficiently as retractors on tumors and tissues too friable to be held by a clamp, also to remove echinococcus cysts from the main sac. In one case a large inaccessible gall-stone was removed from the common duct by means of a stiff rubber tip.

FRACTURE OF THE EMINENTIA CAPITATA[1]

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Fracture of the eminentia capitata (capitulum or capitellum humeri) is of rare occurrence, if we may judge by the scarcity of cases recorded in surgical literature.

Carleton P. Flint (Surgery, Gyn. & Obst. for Sept., '08), reports a case of his own and presents the histories of fourteen other cases, which included apparently all cases so far reported. It is possible, however, that many cases have, in the past, gone unrecognized, and that with a more general use of skiagraphy a larger literature will soon be available. Meanwhile every accurately observed case should be reported, in order to throw additional light upon the nature and results of the lesion and to formulate more clearly the requirements of its successful treatment. Of the textbooks to which I have had access, Stimson alone gives a description of this lesion and classifies it as a type of fracture of the elbow.

For the literature of the subject I refer to the above mentioned article of Dr. Flint, which is so complete that I may well feel excused from presenting here what could not be anything but a repetition of what has so recently been published.

Case 1. J., male, aged 9 years, was injured June 8, 1908, by falling from a wagon and striking on his left elbow. Examination within an hour or two of the injury yielded the following findings:

Complaint of pain in elbow, almost absent when quiet, slight on partial passive flexion and extension, severe as more forcible passive motion was attempted. Active motion limited to an arc of about 40 or 45 degrees. Passive motion possible from flexion at about 45 degrees to about 140 degrees. Pronation and supination practically normal, both passive and active. Slight general swelling of elbow, more marked on radial side. Tenderness limited to radial side, and well-marked only over the external condyle at and near the portion articulating with the head of the radius. Bony landmarks of elbow in normal relation and none of them movable. Head of radius distinctly palpable in normal position. Despite painstaking examination and comparison with the other elbow, I did not at this time, nor subsequently, discover any undue hard prominence in the bend of the elbow in front of the external

Fig. 1. Uninjured right elbow, boy 9 years old. Skiagraph taken with ulna resting on plate. Note cartilage joining capitellum to external condyle.

[1] Read at the annual meeting of Chicago, Milwaukee and Saint Paul Railway Company's Surgeons, Chicago, December, 1908.

condyle, or any particular vacancy between head of radius and condyle. This may or may not have been due to insufficient accuracy or lack of power of discernment on my part, as most other observers seem to have elicited these diagnostic features at their first examination. At no time was crepitus noticed. I looked upon the case as one of fracture of the external condyle of the humerus, with little or no displacement, possibly only an infraction. The elbow was firmly bandaged in cool, moist compresses and the limb placed in a comfortable mitella, forearm at about right angles to arm.

During the week following the patient was seen several times, and passive motion carried out at each examination, the conditions remaining much the same as when first seen. The swelling around the external condyle became more marked and firmer, there was very slight ecchymosis over a small area at the point of greatest tenderness before mentioned, and an undue prominence of the upper part of the supinator longus. He felt so little discomfort that after the first week, despite my instructions to report for treatment, he went to school and did not again present himself until nearly four weeks after the injury. When he returned I found motion about as before, little pain or tenderness, but apparently more thickening and deformity in the region of the outer condyle. Passive motion painful only as its limits were approached; active motion very limited.

I now insisted on an X-ray examination, which I had tried to avoid on account of the financial condition of the parents. The accompanying prints are from the skiagraphs obtained. Figure 1 is that of the *uninjured right* elbow and was

Fig. 3. Fracture of eminentia capitata 5½ months after injury. Motion practically normal.

Fig. 2. Fracture and displacement of eminentia capitata of left humerus, in boy 9 years old. Ulna resting on plate.

obtained for control, as the interpretation of the skiagraph of the elbow of a young person is a most difficult matter, without a plate of the uninjured side for comparison. This plate shows clearly that the union between the capitellum and the condyle proper at the age of nine consists of a well-marked layer of cartilage. Figure 2 is the skiagraph of the injured elbow taken 25 days after the injury. It shows a complete separation and displacement upon the anterior surface of the external condyle of the capitulum humeri, tilted at an angle of 90 degrees, so that the fracture surface faces the humerus. The positions of the head of the radius and other landmarks are shown to be normal.

On July 8th, 30 days after the injury, the boy was anæsthetized and an attempt made to force the fragment back into place; this had little or no definite effect on the position of the fragment, as is shown by Figure 3, which are from plates made Nov. 14, 1908, over 5 months after injury. The arm was now immobilized with an anterior straight splint for 8 or 9 days, after which it was again for a short time allowed to rest in a mitella and then permitted to be carried without support.

Under anæsthesia full flexion and extension could be carried out; pronation and supination remained free.

From this time on the treatment prescribed consisted of active and passive motion, massage carrying pails of water, etc. Despite the fact that this was greatly neglected, the parents wishing to avoid expense and to have the boy attend school, conditions kept slowly improving, all pain and tenderness disappeared, and when last seen, in Nov., 1908, both active and passive motion had a range of from about 45 to 165 or 170 degrees. The prominence of the upper part of the supinator longus remains, and the limb has considerable of the gunstock appearance.

A study of the cases thus far published justifies the following brief summary of the causation, varieties, symptomatology, and treatment of the lesions under consideration:

Etiology. The most frequent cause appears to be direct violence to the flexed elbow; falling upon the extended palm, striking with a heavy implement, and one or two other varieties of injury are mentioned.

Varieties. The articular cartilage alone may be detached, or a fragment may consist of this together with any portion of the bony substance of the capitellum, it may consist of the entire capitellum detached from the condyle in the line of the original cartilaginous attachment, or again, it may carry with it a smaller or larger shell of adjoining bone. The displacement in the majority of cases is forward, but the fragment may be found resting behind the external condyle or between it and the olecranon process.

Diagnosis. Given the history of direct violence to the radial side of the elbow, or of other violence resulting in injury referred mainly to this region, moderate restriction of flexion and extension, pronation and supination normal or nearly so, the landmarks of the elbow intact, pain and tenderness pretty well limited to the distal part of the external condyle, swelling very moderate and most marked in the same region. In the presence of this symptom-complex careful search should be made for the presence of the one distinguishing clinical feature; namely, the presence of a hard movable body in front or behind the external condyle. X-ray examination should in all cases confirm or correct the clinical findings.

Treatment. Removal of the detached fragment was required in the reported cases before satisfactory motion at the elbow could be restored, and it seems to have been followed by uniformly good results. In my own case operation was refused, but the result shows that in children at least we may obtain a very satisfactory degree of motion without resorting to open operation. Notwithstanding this, I should advise the removal of the fragment in all cases, believing it will bring about more rapid restoration of function, and leave behind practically no deformity, in other words, yield a more perfect anatomical and functional result than will follow upon the non-operative treatment.

PSEUDO-HERMAPHRODITISMUS MASCULINUS EXTERNUS

Report of Two Cases with Remarks on Treatment and Medico-legal Questions

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This group of pseudo-hermaphrodites, with testicles, is comparatively speaking, common. In it the external genitals approach the female type and the appearance and build of the body are feminine. The following two cases came under my observation within the last five years.

Case 1. Mokhoda,[1] aged 22, a low class Bengali Hindu, was admitted in the Campbell Hospital on 13th November, 1904. In deportment, the patient was shy and modest. She[2] gave me the impression that she had some secret to reveal, but was not at all communicative. With some coaxing, I obtained the following facts from her. She had no friends or relatives and lives by working as a maid-servant in a Bengali household. She was married as a girl, at the age of nine. The husband, however, died in two years. She never lived with her husband. There was never anything like menstruation. She complained of some irritation about the genitals and said, that, with the slightest provocation "that thing" (pointing her finger towards the small penis-like body) troubled her. She wanted something done to relieve her.

General appearance. She was of medium stature with body fairly developed and nourished. The gait was feminine in character. The figure was of the female type, with rounded outlines, a broad pelvis, a small larynx, and a feminine distribution of the body hair. Hair on the head was soft and about twelve inches long. The suprapubic hair had the female outline and did not extend up towards the umbilicus. The skin of the upper lip, chin and cheeks was quite soft and smooth. She usually talked with a suppressed tone, though her voice was markedly feminine. Her hands and feet were like those of a woman. She had an unhappy and melancholy facial expression. The habits, feelings, and desires of the patient were feminine, as is usual in these cases, due to the surroundings of early life. There was some development of the breasts, which consisted of adipose tissue, with well-marked nipples. (See Fig. 1.)

Genital organs. The external organs of generation looked on a cursory examination, very like those of a woman. The mons veneris and the labia majora were present but there were no well-marked labia minora. The left labium majus was a little larger than the right

[1] A female name.

[2] In referring to these individuals I shall use the feminine epithet.

one and contained a tender almond-like body, which slipped up into the abdominal cavity, on manipulation. The position of the clitoris was occupied by a diminutive, imperforate penis, with a well-marked glans, the size of the organ being about one and one-half inches long by five-sixteenths of an inch in diameter. The prepuce could be drawn forward to a certain extent over the glans but retracted immediately. The penis became erectile on the slightest irritation, especially of the urethra. In Fig. 2 a glass catheter has been inserted into the urethra and the erected penis,measuring about one inch in diameter, with the strongly retracted prepuce, is well seen. The penis was restricted in its action by a broad frænum which reached from near the glans to the under surface of the symphysis pubis. A narrow strip of mucous membrane ran along the free border of the frænum as a groove, as in cases of hypospadius. The urethral opening was continuous with this groove. Immediately below the opening of the urethra there was another opening (vagina?) which ended in a cul-de-sac and admitted my little finger to the depth of an inch. On bimanual examination, with a finger in the rectum, no internal generative organs could be detected.

After a few days stay in the hospital, during which time I managed to get the photographs, I amputated the penis and also extirpated the genital gland from the left labium majus. The latter on microscopical examination proved to be a testis. She left the hospital after a few days, happier than before and absolutely believing herself to be a woman. I have seen her again about five months ago, and there has been no change in her.

CASE 2. In October last, I was asked by a very respectable Hindu gentleman to see his niece aged 15, with a view to give my opinion as to why her menstruation had not appeared. Her father died a few years ago but the mother, four brothers, and two sisters were living. All of them are well formed.

Fig. 1.

Fig. 2.

As soon as I saw her, I was impressed with the masculine build of her body and her masculine voice. The hands and feet were quite large, as also all the bones of the body. The larnyx was prominent and there was a faint hairline on the upper lip. The chest was quite smooth. The genitals were much like those in case 1, excepting that a testicle could be felt in each half of the divided scrotal folds and the penis was larger.

There was no difficulty in coming to a conclusion about her sex, and I explained to the uncle that she was really a male.

I was then told that in her infancy she had been examined by two reputed obstetricians of Calcutta and certified to be a female child. She was married at ten and went to live with her husband two years later. Her mother-in-law however noticed that there was "nothing feminine" about her and sent her back to her mother, with whom she is living now. The husband has married again, the parties having come to terms about her maintenance.

I advised that there should be a redeclaration of sex and some plastic operation should be attempted.

TREATMENT

The question of surgical interference in these cases is no doubt a difficult one. Neugebauer (1) analyzed 930 cases from literature and found that surgical interference was sought for in the majority of cases either for (*a*) the cure of a hernia or (*b*) when the parents or the individual concerned demanded the amputation of a hypertrophied clitoris or of a hypospadiac penis. There were 42 herni-

otomies in which errors of sex were discovered. In one instance only, the operation demonstrated the femininity of the pseudo-hermaphrodite. He also mentions a few cases (including two of Sanger), in which the genital glands — subsequently proved by microscopical examination to be testicles — were removed by mistake. Christopher Martin (2) reported two cases of this nature in both of which the tender genital glands in the inguinal regions were removed. These glands on microscopical examination proved to be testicles. Ballantyne (3) questions whether we are justified in removing the sexual glands in pseudo-hermaphrodites, although he admits that the alternative procedure of making a redeclaration of sex is also attended with difficulty and great inconvenience. Neugebauer (1) collected four cases in which operation for the amputation of a hypertrophied clitoris or of a hypospadiac penis was undertaken at the request of the parents or the individual. He declares these operations to be "quite unjustifiable." Goffe (4) has reported a case very similar to my first case, in which on the expressed wish of the patient to be made like "a woman," he amputated the penis and utilized the skin covering it for the formation of a vaginal canal.

Taussig (5) commented on Goffe's case in a paper entitled "Shall a pseudo-hermaphrodite be allowed to decide to which sex he or she shall belong?" He summed up as follows: "We must in these cases either (*a*) wait up to the 25th or 30th year for the appearance of some positive sign such as a menstrual flow, the ejaculation of sperma, or the descent into the scrotal sac where palpable, of testicle, epididymis, and cord, or (*b*) perform a diagnostic laparotomy. After the sex has thus been determined in one or the other way *and not before* the surgeon can with safety proceed to whatever external plastic, *conforming to these findings*, the patient may desire to have performed." Neugebauer advocates the performance of laparotomy to determine the sex, and would not allow the individual in question to choose the sex. Scientific code recognizes only males and females.

I am, however, strongly of opinion that to decide the above question we ought to take into consideration the following factors: (*a*) The social status and education; (*b*) the sexual inclination and mental condition; (*c*) the prevailing social customs and environments; (*d*) the mode of earning a living, and finally (*e*) the fact that the genital organs are commonly so defective as to be wholly unfitted for the functions of either sex (assuming, of course, that we are able in all cases to assign the sex). It is in consideration of the above facts that I gave different opinions in two cases of very similar nature from a scientific point of view.

In my first case the patient was a low class uneducated Hindu, incapable of thinking or judging for herself. She had no relatives or friends and had to earn a livelihood for herself. She had a strongly feminine inclination. In India hermaphrodites are looked down upon as outcasts, degraded, unclean, and inauspicious. In this case if I redeclared her sex, she would have been a complete outcast. No Hindu would give her employment. She could best earn a livelihood by working as a maid-servant, which she had been doing. Moreover it was not possible to make her like a man. Under the circumstances the best course was to make her like "a woman." To this day she believes herself to be a woman. She is of course out of harm's way, as widow remarriage is not allowed in Hindu society.

In my second case, the circumstances were quite different, and I had no hesitation in redeclaring the sex. The patient might now claim her civil rights as a male.

MEDICO-LEGAL BEARINGS

1. Determination of sex. Erroneous determination of sex in pseudo-hermaphrodites is pretty frequent and leads to grave consequences. The development of the genital glands is very often arrested in a rudimentary stage, and even a very minute histological examination is often insufficient to determine the question of doubtful sex. The practitioner should therefore abstain from giving a diagnosis in a case of doubtful sex, especially in the case of a newborn child. Neugebauer suggests that for purposes of registration of the sex and the civil rights of the newborn, the Government should admit as a new rubric "sex undetermined," the child to be presented for renewed examination at the age of one year, at puberty, and at certain intervals subsequently until a decision could be arrived at. In the majority of cases, the true sex, even when undetermined at birth, declares itself spontaneously at puberty. But there are certain cases in which the task before the medical man is a much more difficult one. Neugebauer had a case under his observation for eleven years, where repeated examination since the age of eight failed to decide the question of sex, till one testicle descended and ejaculation took place. The practitioner, therefore, should try to find the testicles with their adnexa, on one or both sides, and if he succeeds, the individual is certainly a male, even although the urethral meatus opens inside the orifice of a vagina and labia minora. In the new-born we cannot explore

the rectum for prostate or uterus, and these organs, even if found, would not at all decide the sex of the infant, seeing that a male pseudo-hermaphrodite may have a uterus and the female, a prostate. In the newborn it is also not easy to elicit the reflex of the cremaster. Klebs held that the presence of labia minora was a sufficient proof of the feminine sex, but this is not so, as there have been numerous male pseudo-hermaphrodites with external genitals exactly like those of a normal woman. If for any reason one has to decide immediately the sex of a particular individual without any sign of testes in the labial folds and without waiting for a long time for their descent, one has got to follow Neugebauer's advice to perform a cœliotomy.

How should a child of undetermined sex be brought up? Ahlfeld (6), Zweifel (7), Lawson Tait (8), Herman (9) and Bovee (10) recommended that every child of doubtful sex should be educated as a boy. In my opinion this rule is a good one and will avoid a lot of complications. In India especially where girls are given away in marriage before puberty, amongst the majority of the Hindus, the immense advantage of following this rule is apparent. On the other hand it has been advised that the child should be treated as a girl, on the ground that it is far easier to protect a child from the disagreeable result of a genital malformation in the social position of a girl, than in that of a boy. This latter advice,[1] according to Neugebauer, deserves consideration, but with some reserve. "It is well to remember that a male hypospadiac, brought up as a girl and restored to his proper social position at puberty, will suffer far less from necessary changes in his mode of life than a female pseudo-hermaphrodite brought up as a boy would under corresponding condition. There is, however, a danger that must not be lost sight of. Suppose that an infant of doubtful sex is brought up as a girl and attains the age of puberty. The supposed young girl of 16, then, has her sexual instincts aroused by reading romances; sharing the dormitory of her fellow pupils, she watches every night and morning these maidens at their toilet and without any restriction has opportunities of learning to admire the bodily charms of persons of opposite sex. Would not this be enough to awake in him, however innocent hitherto in regard to sexual matters, desires that might easily lead him to abuse the situation in a way which might be followed by consequences even more serious perhaps for the companions sacrificed to his masculine desire than for himself? A male pseudo-hermaphrodite, brought up as a girl was employed as forewoman in a manufactory in Paris, in which only women were employed; but was not long in that position before he had behaved like a wolf in a sheepfold."

"Therefore, all medical men, midwives, the clergy, masters and mistresses of schools ought to be informed upon the practical bearings of pseudo-hermaphroditism and errors of sex, in order that they should take warning in time and consult a doctor of experience, directly their suspicions as to an error in sex were aroused."

2. Inheritance. According to English law an individual does not lose the rights of inheritance on the ground of sexual monstrosity except under peculiar legal conditions such as (*a*) when the right of succession or inheritance to landed property or to a title of nobility depends upon the sex, or (*b*) when rights of persons are dependent upon the sex of a pseudo-hermaphrodite which lives only a few moments after birth. The question of tenancy by courtesy or the right of the husband to landed estate of which the wife was seized will depend entirely upon the attention of the accoucheur on this point, who should make a note thereof at the time of birth after a proper and careful examination.

Lord Coke has stated that according to the law of England a hermaphrodite may be either male or female and it shall succeed according to the kind of sex which doth prevail. Hindu law excludes impotents (or hermaphrodites) from inheritance. Mr. Sarkar (11) devotes one chapter on exclusion from inheritance and divesting, and quotes four original texts in Sanskrit from (*a*) Manu IX, 201, (*b*) Narada XIII, 21, (*c*) Devala and (*d*) Yajnavalkya II, 141–143, containing reference to impotents. The following is the English translation of Devala's text: "When the father is dead, an impotent[1] person, a leper, a madman, an idiot, a blind man, an outcast, the offspring of an outcast, and a person wearing the token of a religious order, are not entitled to a share of the heritage; food and raiment should be given to them excepting the outcast; but the sons of such persons being free from similar defects shall obtain their father's share of the inheritance."

It will be seen, however, that in the case of pseudo-hermaphrodites, the exclusion is not total, as they are entitled to maintenance. Amongst the

[1] Neugebauer attributes this advice, wrongly I presume, to Lawson Tait. I quote the following passage from Tait's book (8): "And in all cases of difficulty it is a good rule to assume that it is a male child, unless the contrary can be shewn." I have not been able to find any subsequent references to Lawson Tait's writings, contradicting the above expressed opinion. Moreover Tait's opinion, as quoted here, has been referred to by Ballantyne (3).

[1] Six varieties of impotency are defined by Devala, but for practical purposes the following two are recognized: (*a*) the impotence of one who is deprived of the generative organs and (*b*) the incapacity of doing the virile act although the generative organs exist.

causes of exclusion, sex is one. Females are as a general rule excluded from inheritance. The other causes of exclusion are certain moral or religious, mental and physical, defects and deformities. Act XXI of 1850, commonly known as the *lex loci* Act has removed some of the above disabilities; e. g., renunciation of the Hindu religion. Defects of external organs of sense and of action must be *congenital*, so as to exclude the individual from inheritance. It has also been held by Indian courts of law that these defects must also be incurable. The strict rules of exclusions as given in the *Sastras* (Sacred Books) have been considerably modified by legislation and judicial decisions, which was inevitable in a progressive society and consequent change of ideas. Questions connected with the above disqualifying provisions and consequent privation of the right of inheritance are not by any means frequently litigated in India. Indeed I have not been able to find a single case reported in which a male pseudo-hermaphrodite claimed his right of inheritance.

3. Divorce. Sexual malformation involving impotency and sterility, constitutes one of the *canonical* impediments to marriage, and marriage contracted by a party with such malformation is voidable under English law. Hindu law does not recognize divorce, although divorce is allowed *by custom* in some parts of India. Of course marriage becomes nullified as soon as it is found out that the so-called girl is a male pseudo-hermaphrodite (as in my cases).

Amongst the Hindus the remarriage of girls is prohibited and hence the question may arise, can a girl, whose husband is declared to be a female pseudo-hermaphrodite, remarry? Mr. Sarkar, Dean of the Faculty of Law, University of Calcutta, was asked to give his opinion in a case in which the husband was declared and proved to be impotent. He held that the marriage was nullified when it had been proved that the husband was incapable of performing the functions of a man. The girl was married again. Of course the same opinion will hold good even with greater force in a case of a female pseudo-hermaphrodite.

In connection with this subject the following questions may crop up. In the event of a medical man discovering that a wife is really a pseudo-hermaphrodite and male, is it his duty to inform the husband? In such a case can the husband be forced by law to divorce his "wife?"

4. Legitimacy. Pseudo-hermaphroditism is one of the most common causes of impotency or sterility, and therefore the legitimacy or parentage of a child will be questioned if either parent is alleged to be a pseudo-hermaphrodite.

5. Civil rights. Questions connected with the following civil rights may come up before courts of law: (*a*) Right of citizenship (U. S. A.); (*b*) Right to exercise the franchise (U. S. A.); (*c*) Right to enter a profession open only to one sex; (*d*) Right of filling certain offices restricted only to the male sex (U. S. A.).

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PROTECTIVE APPENDICITIS AND THE FOURTH ERA IN SURGERY[1]

By ROBERT T. MORRIS, M. D.
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To-day we have heard many papers and much discussion on the subject of appendicitis. What is appendicitis? No such diagnostic entity is allowable at the present stage of our knowledge. We might as well make a diagnosis of "inflammation of the lungs" and be contented with that. The time has now come when we may conveniently classify four kinds of appendicitis. Two of the kinds belong to irritative lesions and two kinds belong to infective lesions. The commonest kind of appendicitis belongs to the irritative lesion described by Senn as "appendicitis obliterans," by Ribbert as "normal involution of the appendix," and by some of our colleagues to-day as "chronic appendicitis." I prefer to classify it as "protective appendicitis," for the reason that it seems actually to protect the patient against infective lesions of the appendix. This protection is obtained in two ways. First, the tissues susceptible of infection are slowly removed from the appendix by degenerative changes. Second, irritated nerve filaments engaged in the sclerotic new tissue of degeneration call out a persistent local hyperleucocytosis which is naturally protective against infection.

The most important disturbance caused by protective appendicitis is chronic intestinal dyspepsia, and most of the cases go the rounds of the profession under this diagnosis, without having attention directed toward the appendix at all.

The chief diagnostic sign of protective appendicitis is hypersensitiveness on deep pressure at the site of the right group of lumbar ganglia, situated approximately four centimeters to the right of the umbilicus.

This right-sided hypersensitiveness at the site of the lumbar ganglia is also of great value for distinguishing between appendicitis and certain cases of disease of the uterus and adnexa, because in the latter class of cases we expect to find hypersensitiveness bilateral, at the sites of both right and left groups of lumbar ganglia.

Protective appendicitis is the joker in the pack of various kinds of appendicitis, and the game of statistics has been played with this joker by physicians as well as by surgeons. We must now leave the joker out of the pack and play our game more fairly without it. (See the author's contribution in the Annals of the Congress.)

The next commonest kind of appendicitis is an infective lesion, which we may call "appendicitis with intrinsic infection." This kind seems to be due to any cause which leads the soft inner coats of the appendix to swell so rapidly within the tight outer sheath that compression-anæmia results, and the tissues suffering from compression-anæmia are temporarily vulnerable to bacterial attack. This seems to explain the reason why acute infective appendicitis runs a course so much more disastrous than the course of similar inflammations of the neighbouring bowel which can swell freely without danger of compression-anæmia.

The third kind of appendicitis represents an irritative lesion, which we may call "syncongestive appendicitis," because it occurs synchronously with neighboring congestions in which serous infiltrates distend the tissues, as in various obstructions of the lymph and blood circulatory systems.

We need give little attention to this form of appendicitis, as it is usually benign and simply gives evidence of its presence by a certain degree of increased sensitiveness or tenderness in the appendix region.

The fourth kind of appendicitis represents an infective lesion which we may call "appendicitis by extrinsic infection." It occurs secondarily to infection of neighboring organs, commonly from infected uterine adnexa, and so gradually that the outer coats of the appendix develop tissue changes and local hyperleucocytosis, which are often quite sufficient to guard against the disasters belonging to acute intrinsic infection.

When are we to operate in appendicitis? In three kinds of cases we may deliberately bring judgment to bear. In acute intrinsic infective appendicitis however, the time to operate is just as soon as the diagnosis is made. Any other standpoint must be immoral because we know from the pathology of the disease that its course always lies outside of the limitations of judgment, and we cannot tell in one hour of the disease what the next hour is to bring forth. It is immoral with our present knowledge and statistics to wait to see what bacteria are going to do to the patient in the next hour, no matter how hopeful or credulous we may be by nature or how much the family of the patient may beg us to deceive ourselves.

[1] Appendicitis Discussion, Section VII, Sixteenth International Medical Congress, Budapest, September 2, 1909.

How about "interval operations" for appendicitis? Under the principles of the fourth or physiologic era in surgery we should not wait for an interval operation, because we know that the patient must then get up an entirely new hyperleucocytosis to aid us, if he has the fortune to get to the interval stage at all.

"Catarrhal appendicitis" has been spoken of by several authors at this Congress. There is no such diagnostic entity. Catarrhal inflammation of the mucosa can occur with all four kinds of appendicitis, but when we dare to make the diagnosis of catarrhal appendicitis — look out! When we make the diagnosis of catarrhal appendicitis it means that we are then to proceed to make the real diagnosis.

Acute intrinsic infective appendicitis has been the one disease above all others, which has led us to note the dawn of the coming fourth era of surgery, which we may call the physiologic era. The first era of surgery was the heroic era. Then came Andreas Vesalius and the anatomists, and we had the second or anatomic era. Pasteur and Lister led in the third or pathologic era and this is the one which at present dominates the surgery of the entire world. Cases of infective appendicitis did not do very well when managed by the highly technical surgical art of the third or pathologic era, and we began to observe several links in concatenation which are now holding us up to a view of the dawn of the coming fourth or physiologic era. The first link consisted of the observation that appendicitis patients with peritonitis and pus in the peritoneal cavity sometimes recovered without operation. That fact required an explanation, which we could not give until Metchnikoff with his studies of phagocytosis, and Wright with his description of opsonins lifted the clouds and gave us the dawn of the fourth era.

Another link was furnished by Clark, when he closed the abdominal cavity completely without drainage after pyosalpinx operations, and gave us surprising statistics.

A notable link was furnished by Ochsner, who astonished us with the results of his starvation method of preparing appendicitis patients for operation. An important link was furnished by the work of Tait. We did not understand its meaning, and it made us very uncomfortable. Some of us tried to escape the discomfort by saying that he must be untruthful. Others felt that a man in a responsible position cannot afford to be untruthful.

To the generalizing type of mind the facts of the patients recovering without operation; the work of Clark, Ochsner, and Tait, and the results of neglect of the principles of the third era of surgery in appendicitis cases with pus; it became obvious that we were all missing some great principle that was plainly being overlooked.

One of the strongest links consists of the statistics of cases of infective appendicitis, managed according to the principles of the new era, in which we conserve the natural resistance of the patient so well that he can manufacture phagocytes and opsonins freely, and can manage infections with these resources better than we do it with our highly developed art of removing products of infection.

Guided by the principles of the third or pathologic era we so damaged the patient, that he could not manufacture phagocytes and opsonins freely. Guided by the principles of the fourth or physiologic era, it is now possible for many surgeons to operate upon a series of one hundred consecutive unselected cases of acute infective appendicitis without having a single death, and in the very same class of cases which a few years ago gave us a death rate of twenty or thirty per cent. Let the patient have the shortest possible period of anæsthesia; the shortest incision, through which a surgeon can do his work; and let the work be completed in the most rapid manner compatible with the degree of safe dexterity. Do not stop to do ideal and fanciful work with the stump of the appendix. Get the appendix out in any practical way so long as it is done quickly, without regard for artistic technique. Pay little attention to separation of adhesions excepting such separation as may be absolutely necessary for removal of the appendix, or for opening multiple abscess cavities. Pay no attention to pus which gets upon normal peritoneum while we are at work. The peritoneum will care for it better than we can with our wiping or washing. Put in the smallest capillary drain which will suffice to lead products of infection out of the peritoneal cavity. Do all of this in five minutes if possible. Get in and get out. Do not waste time in trying to remove fetid pus. It will be particularly difficult for the surgeons of Europe to put aside traditions of the art of the third or pathologic era of surgery which they have conscientiously developed to the highest point permitted by human intelligence, but let me at this Congress give the watchword for successful treatment of cases of infective appendicitis with peritonitis and with products of infection in the peritoneal cavity. This is the watchword. "Run while pus is running. *Pollice presso!* Do not stay to kill the patient."

SUBSEQUENT NOTE

The degenerating appendix found in cases of protective appendicitis is the one that some of my

assistants for purposes of brevity, got to calling "Morris appendix." Some of these appendices are so nearly normal in external appearance that the casual observer might not distinguish them from normal appendices unless he knew the subjective history, and the microscopical findings in any given case. For this reason the name of Morris appendix began to be applied to the perfectly normal appendix, partly in a spirit of levity, and later more seriously, so that I must correct the mischievous nomenclature if possible. Mr. Cleveland said that "nothing is so dangerous as phrases." Apropos, the misuse of a name has led many surgeons to believe that that removal of the normal appendix is advocated. I have always opposed the idea of that operation, on the ground that a small point of infection is opened in the midst of a field unprepared by local hyperleucocytosis. The technique and caution required for such an operation call for the assumption of a greater degree of responsibility than some of us like, when the character of the stake is considered. So far as nomenclature is concerned, Senn and Ribbert recorded observations of the degenerating appendix previous to my taking up a detailed study of the subject.

THE USE OF RUBBER ELASTIC BANDS FOR DRAINAGE

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Drainage of wounds is desirable under certain circumstances, among which the following are some of the chief conditions: (*a*) when a wound is or is expected to become septic at the time of operation; (*b*) when a cavity in the tissues is left into which blood or serum is apt to ooze and collect. For the above purposes drainage is carried out either by a tube or by a gauze drain or by one or other of the methods described below.

Drainage tubes are made of glass or rubber. The use of rigid glass tubes is not so general as it was at one time, on account of the fact that they have been found to produce pain by pressing on the already injured tissues and that they prevent the cavity into which they are inserted from collapsing. Rubber tubes are probably the most satisfactory form of drain which we possess. They are used in various sizes and lengths, according to the conditions present. In certain cases their efficiency is increased by splitting them down one side or by cutting holes in them. Oiled silk and rubber tissue make excellent materials for draining wounds, used either in the form of a strip or folded or rolled into a tube.

Gauze, aseptic or antiseptic, is probably used for drainage more than any other material on account of its always being at hand and of its flexibility. The great disadvantage of using it is that in a great many cases it does not act as a drain; for, either it dries or adheres closely to the surface of the wound thus forming a plug damming back the discharge, or its meshes become impregnated with fibrin and its capillarity is destroyed. It has also the disadvantage of producing considerable pain during its introduction or its removal, to say nothing of the number of granulations broken down by it during these processes. As a result of this irritation sinuses which are dressed in this way daily and presumably drained by a strip of gauze are kept from healing. Small loose threads from the end of a gauze strip are now and again responsible for the persistence of a sinus. Gauze only continues to act as a drain so long as it is kept thoroughly moist either by a profuse discharge or by the frequent changing of moist dressings to the surface of the wound. In private practice and in out-patient work the proper degree of moisture is extremely difficult to always be sure of from the time of one dressing until the next, and then, as was stated above, if it is not kept moist, the gauze no longer acts as a drain. In spite of these facts gauze strips continued to be introduced into abscess cavities and sinuses with the idea that they are draining them. All of you can recall cases in which, when you have removed the dressing, you have found it dry, and on loosening it and removing the gauze strip from the wound, it has been followed by the escape of a greater or smaller amount of pus which has been dammed back into the deeper part of the wound. It is needless to say that such a retention of purulent exudate delays the healing of the wound as well as increasing the toxæmia and suffering of the patient. Most of the above disadvantages are overcome by the use of drainage tubes, or in small wounds by a strip of oiled silk or a bunch of silkworm gut or horse hair sutures.

The ordinary elastic band occurred to me as a convenient method of carrying out the principles of drainage. It is made of rubber, a material which has been used to such great advantage for drainage in the form of tubes. Through the kindness of Dr. A. Primrose and Dr. F. N. G. Starr, to whose services in the General and Children's Hospitals I am attached, I was enabled to put this method of drainage to a practical test. It was applied in all cases in which drainage was required, with the exception of those cases in which a tube was still considered advisable. From the test cases, of which a list is appended, it was learned that the discharge was taken up into the dressing, practically none of it being dammed back into the cavity as the result of drying around the mouth. The discharge was found to run up between the approximated surfaces of the two layers of rubber, as well as between the outer surface of the band and the surrounding wall of the sinus. If the smooth surfaces of two impermeable bodies are placed in contact and one of them is put into a solution the fluid will work its way along between the adjacent surfaces by the action of capillarity, the old example of the fluid spreading out between a coverslip and a slide being familiar to you all. As the approximated surfaces of the bands were always moist with discharge and the cavity emtied of its contents it was considered that capillary action was the force which was responsible for the draining of the wounds. This principle of capillary drainage has been used for years by introducing a number of strands of silkworm gut or horsehair into the wound. The same principle is also active when a piece of folded oiled silk or rubber tissue is used as a drain. The rubber band, therefore, is only another convenient method of applying this principle.

Among the advantages of the bands that were noted, were the ease of introduction, the absence of pain, and the efficient way in which they carried out the drainage. The bands can usually be readily introduced, having sufficient rigidity in themselves to travel down to the bottom of the cavity with pressure on the outer end, although a probe was necessary to overcome the resistance of the tissues and get the band well into the cavity. In all cases in which a strip of gauze had been used previously, the freedom from pain during and after the introduction of the band was what the patient remarked upon. At the Children's Hospital the small amount of pain in using the bands in contrast with that produced by gauze was the advantage which the nurses who were doing the dressings thought most important. If, therefore, we save our patients pain by using the bands instead of gauze, it seems to me that for that reason alone, the bands are a better method of treating our wounds than is gauze. It was found that the pain which was sometimes produced by a stiff drainage tube against the bottom of the cavity was relieved by replacing the tube by a band. The flexibility of the bands also allows the cavity to collapse and in this way hastens the healing process. On account of the flatness of the band and the small amount of granulation tissue that forms in a collapsed cavity, the resulting scar with its subsequent contraction will be small.

Some of the principal advantages of rubber bands might also be mentioned. They are cheap and easily obtained. They are made in all sizes from a small strand-like band up to those an inch in width and six or eight inches in length, and therefore do not require to be cut or prepared for the wound. The size of the band selected will vary according to the depth and capacity of the cavity, the length of the wound into the cavity, and the amount of discharge from it. They can be readily sterilized by boiling and kept ready for use in a bichloride solution. They can be prevented from slipping into the wound by leaving the end outside long or by putting a small strip of dressing through the outer loop or by a safety pin.

In view of the above facts, rubber elastic bands seem to me to be a very convenient and efficient method of draining wounds. They are more easily and painlessly introduced and induce less newly-formed granulation tissue than does gauze, as well as draining more satisfactorily, and therefore should replace gauze in a great many of the cases in which it has been used in the past. As to their use in relation to that of the drainage tube, I am not yet in a position to say anything more than that in many cases with large sized cavities and very profuse discharges, the tube is unquestionably the best form of drain; but still a number of cases in which the bands were tried have shown me that many medium sized cavities are just as efficiently drained by a band as by a tube.

The conditions in which I consider that rubber bands will carry out drainage satisfactorily are abscess cavities, acute and chronic sinuses, operation wounds of medium size in which bloody oozing is expected, e. g., thyroidectomy, or in which the wound is expected to become septic.

Among a list of 28 cases in which drainage was carried out by the use of rubber bands are the following which will illustrate to some extent the kind of case in which they have proved successful:

Carcinoma of glands of neck. Infiltrating muscle, deep fascia, and vessels. Cavity drained through stab drain.

Appendical abscess. Two weeks' standing. Drained through flank. At first with tube and later with band.

Thyroidectomy. Cavity drained through stab drain. Dressing saturated with blood when changed after 48 hours, with no collection in cavity.

Compound fracture of humerus. Cut down upon and plated. Drained with band. Dressings soaked with blood. Wound healed by first intention.

Empyæma. Resection of rib. Drained at first with tube, but later with band. Relieved pain which was caused by pressure of tube.

Acute infective arthritis of knee. Drained at first with tubes, and after first few days with bands.

Umbilical fistula. Plastic operation. Wound infected. Drained for a few days by band. Closed rapidly.

TWO INTRACTABLE CASES OF VESICO-VAGINAL FISTULA

By E. SINCLAIR STEVENSON, M. D., F. R. C. S., Rondebosch, Cape Colony

The repairs required for mending a vesico-vaginal fistula are never an easy task to perform, much depending on the situation of the opening. Those which occur subsequently to an operation for the removal of the uterus are very difficult. In such cases the roof of the vagina is fixed; it cannot be drawn down and is inaccessible to the manipulations required. This difficulty is due to that, whilst mending the open space in the cul-de-sac, the parts are drawn together, narrowed, and pulled upwards; it is probable that adhesions have something to do in fixing the parts as well. This complication is fortunately rare, and I can only illustrate the point by two cases which have come lately before my notice.

A young girl was operated upon for a large myoma which was growing rapidly; a suprapubic hysterectomy was performed. On the fourth day her temperature rose in the evening, and during the night a slight discharge escaped through the vagina. On examination the next morning it was found that a small abscess had opened close to the left side of the cervix. Shortly afterward urine escaped. It became then evident that the accident was due to a stitch which had passed through the wall of the bladder. During the examination the cervix was seen to be drawn upwards and invaginated into a narrow funnel-shaped cul-de-sac. Some time after an attempt was made to repair the mischief, and it was found impossible to draw the cervix down. Several attempts were made at different times without success. Finally, by splitting the cervix, and using the left half to repair the opening, the fistula was at last closed up.

The other case happened in a patient who had been operated upon for sarcoma, colpo-hysterectomy had been performed, and whilst separating an adherent bladder its wall was unfortunately torn. This was repaired at once. A fistula followed. The same condition of things was found as in the previous case, the opening was seen to be situated at the apex of a cone-shaped vaginal apex which could not be drawn down to the outlet. Several attempts were made at different periods but without success. The opening was then as large as a three-pence, and the condition of the patient was deplorable. A transvesical operation was performed, the bladder opened extraperitoneally, the fistula opening easily seen and sewn with fine catgut. Unfortunately, through carelessness, the supply ran short and the operation had to be finished with fine silk. The wound healed rapidly, the patient returned home apparently cured. Six weeks later she came back suffering from symptoms of calculus, a complication which had been anticipated. Attempts were made to crush the stone but the stone was lying at the bottom of a narrow space and could not be seized. The urethra was then dilated and the index finger passed into the bladder and by pressing on the stone localized the spot in the vagina, which was opened and a phosphatic calculus one inch long, fusiform in shape, was delivered through the vaginal opening, bearing down with it the piece of silk to which it was tied and had caused this untoward accident. The patient was kept for some time in bed during which the bladder was constantly irrigated. Finally the opening of the fistula was repaired in the following manner. The urethra was dilated again and an assistant with a gloved finger introduced in the bladder and pressing on the opening, causing the floor to bulge downwards in the vagina, the point of the gloved finger could be seen pointing to the part which was to be repaired and fixing it in a comparatively accessible position. By this method the fistula was easily dealt with.

I have little doubt that if this method had been thought of at the first operation success would have followed. It is now more than eighteen months since this was done and I hear that she is well, and that there are no signs of a stone having re-formed.

It is possible that this way of dealing with this complication has been thought of already. I have never heard of it before, and I think it advisable to describe it in order that it may help others who may be placed under the same difficulty. This procedure will, in all difficult cases, be of material assistance.

THE SO-CALLED MURPHY-FOWLER AFTER TREATMENT OF APPENDICITIS

The Universal Misapprehension in Regard to the True Cause of the Cure of Those Cases Complicated by Diffuse Suppurative Peritonitis

By GEORGE S. BROWN, M. D., Birmingham, Alabama

The introduction of the above method in the after treatment of these heretofore deplorable cases has been followed by the most marked fall in mortality rate that has been seen since that, perhaps, in the removal of abdominal tumors following the advent of aseptic surgery. While it is perfectly clear that the improvement has been due to the *introduction* of this method, it is the intention of this paper to show that it has *not* been due to the *practice* of those steps of it whence the method derives its name; the Murphy proctoclysis and the Fowler position, but to the practice — borrowed from the plan of Ochsner, offered to take the place of operation — of emptying the stomach and bowel by means of the stomach tube and withholding food and purgatives.

When a boon like this comes to the profession from a distinguished and reliable source it attracts universal notice and is at once put to wide-spread proving. If it proves good it is jubilantly accepted by the whole profession and escapes that careful analysis it would have met with, had its results not been so immediately perfect. In this instance gratitude for a method giving such results was enough to prevent criticism, and even with the unemotional there seemed to be no need to strain one's eyes, as it were, closely inspecting a thing that was so certainly plain at a glance. It is probable, however, that this misapprehension as to the true cause of this complete reversal of the mortality statistics — from almost universal death to universal life — would not have been possible had there been, previously, a proper understanding of nature's method of treating and curing peritonitis. I refer to the common error of regarding the so-called paralysis of the bowel, which is constantly present in these cases, as a vicious complication to be vigorously combated, instead of recognizing it as a beneficent agent of nature; her method for allowing adhesions to form to hold the inflammation in check. Up to about twenty-five years ago, it was the practice to treat perityphlitis, pelvic cellulitis, and peritonitis (the nomenclature of the time) by keeping the patient quiet, withholding food and purgatives, and helping nature to' 'splint the bowels" by giving opium.

Up to the advent of the Murphy-Fowler treatment it had been the practice with practically all surgeons in this country, to follow all operations for appendicitis with purgatives.

There was universal agreement, however, that we could not hope for good results unless the operation was done before diffuse peritonitis set in; an acknowledgment that operation would not cure patients with diffuse suppurative peritonitis.

It has never been the practice of the writer to give purgatives after any operation for appendicitis, and in 1903 he read a paper in Atlanta before the meeting of the Southern Surgical and Gynecological Association in which he reported twelve cases of appendicitis complicated with diffuse, suppurative peritonitis, nine of which recovered. Up to this time the practice had been to combat paralysis of the bowel and the formation of adhesions by giving purgatives. There was no reason for this except that, as each surgeon said, he felt better when the patient's bowels moved, because when they did move the patient nearly always recovered. Contrary to this it had always seemed to the writer, that adhesions were nature's only way to limit the spread of the inflammation and that adhesions could not form unless the peristaltic movement of the bowel was arrested. The title of that paper was "The Significance and Management of Paralysis of the Bowel." The mechanism of this process seemed then, and has always seemed about as follows. When the serosa of any part of the bowel is inflamed, the muscular coat of the bowel under it and in the neighborhood would vary in its activity from a slight sluggishness to complete paralysis, according to the degree of the inflammation. If the inflammation was severe and the paralysis complete the traffic of the bowel would be entirely arrested because nothing can go through bowel except by means of the peristaltic movement. If not interfered with nature will, in most cases, cause these adhesions to become stronger and stronger and by this means alone limit the infectious action to a comparatively small area of the peritoneal surface. If nature is able to do this, in a given case, and then get the upper hand of the infection, the peristaltic action will gradually wake up as the inflammation subsides or (as in the case of abscess formation) the adhesions become strong

enough to be in no danger of giving way. Several years ago, when appendicitis was called typhlitis or perityphlitis, it was the practice to keep the patient and his bowels quiet until it was clear that nature had cured the diffuse peritonitis and limited the infection to the formation of an abscess which could be incised and drained; indeed, for some time after operations for appendicitis became common, we frequently had cases come in with large abscesses to be treated in that way. The histories of these cases were, invariably, that during the first few days of the attack, while the symptoms were severe, there had been paralysis of the bowels which had gradually passed off as the abscess formed, and that the bowels were then moving daily. About the year 1904, when for some years surgeons had agreed that it was almost useless to operate for diffuse suppurative peritonitis, Ochsner deliberately advised that, with these desperate cases, we go back to the quieting and tiding-over treatment of the older practice and wait for the abscess to form. In addition to the older practice, Ochsner advised washing out the stomach and the upper bowel by way of the stomach, with the stomach tube. The trouble with this treatment as with the older practice, was that a certain per cent of the patients would die because a gangrenous appendix had leaked out more infectious material than nature was able to cope with and successfully limit by means of adhesions. Shortly after this I wrote another paper with the title "The Ochsner Treatment as Applied after Operation." It seemed to me — and my results had borne it out — that if nature could, in many cases, overcome the inflammation to the formation of an abscess, with the diseased appendix still present, she could do it much better or more often, after the appendix had been removed. As nothing can pass through bowel where the peristaltic action is in abeyance, the administration of a purgative will cause an outpouring of bile and intestinal fluids and set up a lively action in the healthy portion of the bowel *above* the inflamed portion. This will be carried down to the *paralyzed* portion and by its motion and tugging will tend to interfere with the formation of adhesions, or break up adhesions not yet strong and cause the infection to spread.

And again, it will, not being able to pass the inflamed portion, cause a *reverse peristaltic* wave and bring the contents of the bowel up into the stomach, constituting regurgitant vomiting, which of itself alone, will quickly reduce the patient to a serious condition.

The principle to act upon, it has always seemed to me, is that the *upper healthy portion of the bowel should be kept quiet until the inflamed portion shows that the inflammation is subsiding by itself beginning a feeble motion.* The healthy portion will remain quiet if it is kept empty by means of the stomach tube and by withholding all food and *purgatives. In other words, when the bowels show a tendency to move, it is a sign that the inflammation is subsiding but we should not reason from this that forcing the bowels to move will cure the inflammation.*

The general experience was that those patients operated upon early were given purgatives and recovered; those operated on late were given purgatives and died. Hence it was not unnatural to conclude that purgatives did not much influence the result one way or the other. It happens now and then, in a vigorous patient or in one in whom the inflammation was not as bad as it seemed, that nature will resist all insulting treatment by purgatives and, in a few days, cure the peritonitis up to the point where the bowels will move, when of course, the purgative will be given the credit of the cure. So far as I know I stood alone at that time in the opinion that the bowel movement was an *indication* that the inflammation was *subsiding* and was not a *cause* of the cure, to be *forced* with purgatives, and that trying to force it was responsible for by far the greater number of those deaths occurring, as a rule, several days after the operation and having for the distinctive feature *regurgitant vomiting*. My results in these desperate cases convinced my immediate associates, but others in our neighborhood society meetings continued to argue "that they felt better when the patient's bowels moved." To these we tried to illustrate our belief in their confusion of cause and effect by the homely simile that "the bluebird is a fairly safe indication of the approach of spring, but it would not be rational, on this account, to try to force an early spring by importing bluebirds."

Notwithstanding our somewhat localized efforts, however, this confusion of cause and effect in the surgical mind of the time, was wide-spread, and the heroic efforts to force the bowels to move after operations for appendicitis — to prevent adhesions and paralysis of the bowels — were continued even when fecal vomiting was killing the patient, some even trying to find purgatives that could be given hypodermically. It is no burlesque of history to say that consultations between physicians and surgeons were often held in the bathroom, over the bedpan, and that acuteness of eyes, ears, and olfactories, in enabling one to first find hope for the family and family physician by detecting the longed for feces or flatus much enhanced the

vogue of such a comforting consultant in the community.

In 1905, Murphy read a paper before the Southern Surgical and Gynecological Association, in Birmingham, Alabama in which he reported twenty-nine cases of diffuse suppurative peritonitis complicating appendicitis, with twenty-eight recoveries, operated upon by the Murphy-Fowler plan. In this he had adopted Ochsner's plan of withholding purgatives, but singularly gave little credit of the cure to this step of the procedure.

At the meeting of the same association held in New Orleans in 1907, Dr. Stewart McGuire of Richmond read a paper in which he said that before he adopted the Murphy-Fowler plan he had lost five out of six patients with diffuse, suppurative peritonitis, while since using it he had had sixteen recoveries out of seventeen cases. His paper in the transactions has seven or eight pages given to the Murphy proctoclysis and the Fowler position, two or three of which are given to explaining his own excellent device for elevating the bed and the seat for keeping the patient from sliding to the foot of the bed, while he gives only three and a half lines to the fact that he no longer gave purgatives. Neither he nor Murphy remembered my paper of the meeting four years before, with my excellent results which were clearly due to the fact that I kept the bowels empty with the stomach tube and withheld food and purgatives, as I used neither the proctoclysis, the Fowler position, nor McGuire's elevating device and seat. Practically the only difference between the treatment followed from the time of McBurney's classical paper down to 1904 when Ochsner called a halt voicing the universal opinion that these desperate cases could not be cured by operation, and the plan by which I obtained my good results was that I *did not give purgatives* immediately after operation. That all others did give purgatives is sufficiently attested by the journal articles and the text-books of that period. To mention only one of these, Kelly's book on appendicitis of 1905 is most urgent that purgatives be given and the more desperate the case the greater necessity, he says, that purgatives be given promptly and actively.

It is beginning now to be seen that contamination only does not mean infection and by consequence, when we can succeed in removing the source of the supply of the infectious material, nature will be able to kill out almost any given definite amount of inflammation remaining, and if the blood does not already hold a sufficiency of the toxins to kill the patient, he will recover and without the use of a drainage tube. In such cases a drain is necessary only when we are compelled to leave the remains of a thick-walled abscess or some sufficiently solid body that will harbor the germs and constitute a source of indefinite supply of germs and their toxins. Under such conditions and this principle of action, the Murphy-Fowler plan is useless because it is offered only as a help to perfect drainage.

Those patients who have already absorbed a lethal dose of the toxins will die without rallying from the operation. If the use of salt solution will help them it must be more effective if given under the skin whence it may be taken up into the blood before the shock of operation has left the patient moribund. If we wait to give it slowly by the rectum after operation, the patient may be past all help before it is begun.

As all will agree, the Fowler position is useless unless a drain is used. If a drain *is* used there are two objections to it. First, if the patient's condition is bad he will often not bear elevating to the forty-six degrees said to be necessary to drain the iliac fossa into the pelvic cavity, because of his weak heart. In three cases I have seen the heart so quickly and seriously affected that they had to be instantly lowered; one of them came so near fainting that his pulse could not be felt at the wrist. The other objection is that it must be purely theoretical that the serosa of the pelvic cavity has a greater resistance to germs than that of the iliac fossa. On the contrary we might reasonably infer the exact opposite. From the point of view of natural selection the serosa of the iliac fossa has long been exposed to infection of the colon bacilli leaking from a diseased appendix, a much more virulent infection than that caused by any germs in the pelvis poured out by diseased tubes, ovaries, or uterus.

Finally, although the so-called Murphy-Fowler method of operating has given most excellent results and this class of patients are most fortunate in that a plan giving such good results has come from such eminent authority as to secure its immediate adoption, it would still seem most important that surgeons understand clearly the relative importance of its different steps. If Dr. Stewart McGuire had been the first to secure such universal good results and in his first case had used his handy and ingenious method of elevating the head of the bed and his seat to prevent the patient from slipping toward the foot, it would not be right to attribute his cures to these and yet it would seem that the true cause of the cures — abandoning purgatives — has been just as completely obscured. It is curious and interesting that whereas purgatives were invariably given

after operation up to the time of the introduction of the new treatment and that now they are just as invariably *never* given, it does not seem to have impressed any one that it is either interesting and curious enough to elicit even the slightest notice. Purgatives were abandoned by Ochsner's advice, taken in connection with the plan of treatment meant to take the place of operation. In my two papers I showed clearly, I think, that they were responsible for the greater number of those deaths which occurred several days after the patients had seemingly been rescued, by operation, from death from diffuse peritonitis. That is, such patients would rally from the operation and show rapid improvement of all the terrible symptoms of the peritonitis when, after the administration of purgatives, they would develop regurgitant vomiting and die.

In the twelve cases of diffuse peritonitis with nine recoveries, reported in my paper of 1903, the proctoclysis and the Fowler position were not used and, this being at the time when all were giving purgatives and the leading surgeons were teaching that only by early operation could we hope for any good results — that in other words, operation would not cure patients suffering with diffuse suppurative peritonitis — there was nothing to account for my recoveries from this condition except the fact that I did not give purgatives. My subsequent experience has only more fully confirmed me in the belief that many of these worst cases will recover if purgatives are withheld, since I have had five cases certainly, and possibly six, that have recovered under this treatment and without the use of the Murphy-Fowler features.

It seems most important that we should come to a clear understanding of the relative importance of the different steps of this popular and successful method. To do this they who are not already fully satisfied about it can easily test the matter by using the proctoclysis and the Fowler position and also give purgatives immediately after operation as formerly, and, in another series of cases, forego the Murphy-Fowler features but be careful to thoroughly empty the stomach and upper bowel with the stomach tube, withhold all food and purgatives, and keep the patient quiet and conserve what vital energy he has left, by giving opium. As in all surgical experiments in America the welfare of the patient is the first consideration, I would gladly accept all responsibility in urging that the question could be surely and more safely determined by following the latter course in both series of cases.

TOXÆMIA OF PREGNANCY

Report of a Case — Recovery

By HARRY MORELL, M. D., Regina, Canada

The pregnant woman at times exhibits symptoms which are not easy of interpretation. Among the various manifestations of pathological pregnancy, one of the most serious and fatal is eclampsia, the latter, if it is a distinct disease, has many vagaries, and has been reported as occurring as early as the third month, though it develops more frequently between the seventh and ninth months, in some rapidly with a seizure without prodromes, in others it presents a train of symptoms as œdema, defective vision, scanty urine, intense headache, etc. To these the term "Toxæmia of Pregnancy" or the "Pre-eclamptic State" has been applied.

The following case is a good example, showing clinically many of the vicious symptoms.

Mrs. J. American by birth. Aged 35; advanced to the seventh month of pregnancy, mother of four children, the youngest five years old. When first consulted, my first examination showed many of the symptoms as above, œdema of ankles, lower eyelids, and hands, intense headache over eyebrows, dilation of the pupils, with disturbance of vision and at times amounting to total blindness. The patient was dull and apathetic, memory bad, and somnolence. Urine acid, sp. gr. 1023, amount passed in 24 hours at this time, 15 oz. On boiling the specimen became quite solid from the albumin. Urea excreted was not quite 1 grm. to each oz. Microscopically, granular epithelium and hyaline casts were in abundance. Blood hæmoglobin, 65 per cent. Reds, three million to each c.c.

Treatment was carried out as follows:

Patient was put in bed, and an absolute milk diet ordered. Large amounts of water to be drank, hot baths, with rectal injections of normal saline given twice in twenty-four hours. Calomel given until the bowels were free. The old preparation "Bashams" ordered, in medium doses.

After two or three days, the only change noted was the small increase of urea excreted. The patient did not improve; her mind seemed to become more dull, she wanted to sleep most of the time. The question arose, would it be safe to allow the gestation go to full term, or

should premature labor be induced. Obscurity of vision or actual blindness indicate as a rule the induction of labor, or abortion without delay.

We know that the induction of labor or abortion should not be thought of except under clearly defined conditions, and not before we are quite satisfied that every other line of treatment is exhausted and that the operation is to save at least one life, i. e., the mother's, because at this time the child is not to be considered, as it is not viable, and if interference is delayed too long, all chances of saving mother and child will be lost, the mother from eclampsia, the child from want of nourishment from the toxic mother. Another opinion given at this time, was to temporize. Seventy-two hours later, after a rectal injection, the membranes ruptured, but labor did not terminate until three days later.

For the next twenty-four or thirty-six hours the patient was in a desperate condition. My notes are as follows:

Patient in a comatose condition, will not answer questions, pupils dilated, and eyesight entirely gone; pulse 137, temp. normal, when she does talk it is not above a whisper. For two or three days she did not rally; saline injections into the bowel were given every three hours; strych. et digitalin hypodermically every two hours; nourishment per ora was not retained. The patient is profoundly anæmic: urine examination, the urea was increasing, albumin decreasing. Blood corpuscles, red, were normal in shape, no creanation; a count showed three million to each c.c. Ext. of red-bone marrow and strych. were given, but improvement is slow. Six weeks later, the patient left her bed, her eyesight is poor, though the eye grounds are normal.

THE TABLE-SIDE STERILIZER

By JOHN D. SINGLEY, A. M., M. D.
Surgeon to the Pittsburgh Hospital, Pittsburgh, Pennsylvania

Since June, 1908, I have been using a small electric sterilizer *beside the operating table during operations* with such satisfaction that I desire to call attention to its value. There are several such appliances on the market which may be had in different sizes according to the needs of the operator. A convenient size is 10 x 4 x 5 in. It is partially filled with salt solution and placed beside the operating table within easy reach of the operator or his assistant. It is used for (1) sterilization of instruments, and (2) supplying hot salt solution for (*a*) sterilization of wound and (*b*) control of oozing.

Sterilization of instruments. During the progress of operations, instruments occasionally become contaminated from some accidental error in technique; or, what is of more frequent occurrence, contamination comes from contact with the mucous membrane of the gastrointestinal canal or other infective tissue. Such instruments are dropped into the boiling salt solution by the operator or his assistant, to be picked out with forceps in a few minutes when needed, without waste of time.

Hot salt solution. The desirability of using pads moistened in salt solution in abdominal surgery is generally conceded and largely used. The boiling solution beside the operator furnishes a supply of unquestioned character instantly available.

It has been demonstrated that in wounds running an aseptic course and healing by first intention, bacteria are present. Fortunately they are harmless saprophytes or other bacteria of such a low degree of virulence that the tissues are able to cope with them. Their presence proves, however, that we cannot prevent the access of bacteria from the air or other unknown sources.

In an article on Sequestration Anæmia in the Annals of Surgery for February, 1907, Dawbarn speaks of applying to wounds gauze sponges wrung out of water at 212° F. for a few seconds to control bleeding after releasing the tourniquets. He says, "not only is bleeding prevented but the entire raw surface turns white from coagulated albumin, sterilizing it if it was not sterile before. And thereafter, if contaminated by ichorous pus or septic fluids from the mouth or the bladder, for instance, we are reasonably safe from danger of extension of such infection — very much as the surgeon feels regarding such a risk when once his wound is covered with healthy granulations." And again (in a foot-note) "It may be suggested that heat so employed may well take the place of Harrington's fluid, as sealing cut lymphatics and blood-vessels without use of irritant chemicals."

It has been my custom since January, 1905, before closing a wound to place in it a gauze pad saturated with actually boiling salt solution with the twofold object of (*a*) diminishing the danger from unavoidable infection of whatever sort, especially from the air; and of (*b*) controlling capillary oozing and rendering the wound dry, both potent factors in overcoming infection, and sealing the lymphatics and blood-vessels.

In my experience a few seconds' application is scarcely sufficient, one or two minutes being required to produce the best results. Warm pads, momentarily applied, are of no value.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

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Tuberculous Sigmoido-perisigmoiditis (Sigmoïdo-perisigmoïdite de nature tuberculeuse). MÉRIEL. *Revue de Gynécologie et de Chirurgie Abdominale*, No. 2, 1909.

The patient, a young woman, presented abdominal symptoms resembling appendicitis; soon there followed an evacuation of pus per rectum. Despite this evacuation, a tumor persisted in the left iliac region and was thought to be a tumor of the ovary. Upon rectal examination, the examining finger palpated an indurated area occupying the anterior wall of the rectum. The patient was laparotomized. The left ovary was extirpated, also the tube which was large, red, and filled with a caseous liquid. As to the rectum and the sigmoid flexure, they were surrounded by a mass of sclerosed tissue which fixed them to the adnexa in front and to the pelvic wall behind. The author thought he was dealing with a tuberculous recto-sigmoiditis. Not wishing to act rashly, he did not resect the intestine, but he sutured the perforation of the rectal wall. The patient recovered, but several months later, owing to the symptoms of intestinal obstruction, Mériel made a cæcal anus. Several months after, a third laparotomy was made for the extirpation of these lesions. A few days after the patient died from pneumonia. The intestinal tuberculosis was secondary to a tubal tuberculosis. In these cases, resection of the intestine is a difficult operation. The freeing of the intestine from adhesions is at times sufficient to re-establish its permeability. In all cases an antero-anastomosis appears to be preferable to intestinal resection.

AIMÉ PAUL HEINECK.

Removal of a Gauze Sponge from the Scrotum Two and One-half Years after an Operation for Double Inguinal Hernia. HERMAN L. KRETSCHMER, M. D. *Annals of Surgery*, June, 1909.

Under this title Dr. Kretschmer reports a total of six cases in which small bits of gauze have been left in extraperitoneal wounds, and brings out the fact that it is an ever present danger in any operation which must be considered and avoided by having all pieces of gauze in an operating room counted both before and after operation.

WM. R. CUBBINS.

The Cammidge Reaction in Experimental Lesions of the Pancreas. JOHN SPEESE, M. D. and EDWARD H. GOODMAN, M. D. *American Journal of the Medical Sciences*, July, 1909.

The authors base the conclusions drawn on experimental work in which seventeen dogs were used. The lesions in the pancreas were caused by (*a*) injection of cotton seed oil into the pancreatic duct; (*b*) ligation of the pancreatic duct; (*c*) extirpation of the tail of the pancreas at a point immediately below the pancreatic duct; (*d*) severely crushing the tail of the pancreas; (*e*) total extirpation of the pancreas. They were led to believe that occlusion of the pancreatic duct was the principal causative factor in the production of the Cammidge reaction, but were unable to verify same to their entire satisfaction. The conclusions reached by the authors are as follows:

1. The Cammidge reaction is a constant feature in hæmorrhagic pancreatitis, in mechanical injuries of the gland (crushing of the tail, partial extirpation), and in total extirpation.

2. In certain cases of the subacute type of pancreatitis the reaction is inconstant.

3. The nature of the phenylhydrazine compound is not definitely established. If pentose, it is apparently not derived from the pentose-yielding material of the pancreas.

4. A positive reaction is indicative of altered carbohydrate metabolism due to disturbance of the internal secretion of the pancreas.

ARTHUR B. EUSTACE.

Bone Transference. ERNEST A. CODMAN, M. D. *Annals of Surgery*, June, 1909.

Dr. Codman reports a case in which the diaphysis of the tibia was destroyed by osteomyelitis which did not show any signs of regeneration. Upper end of the fibula was then implanted into the upper end of the tibia. Union took place early and the patient was around with the aid of crutch and cast at the end of five weeks. After one year the fibula was strong enough to bear the patient's weight, and now at three years it is perfectly satisfactory, and is about twice the normal size of the fibula.

WM. R. CUBBINS.

Traumatic Rupture of the Kidney Treated by Suture (Rupture traumatique du rein traitée par la suture). FREDET. *Revue de Gynécologie et de Chirurgie Abdominale*, No. 2, 1909.

The patient, a male, received a falling body weighing 2,000 kilograms, upon the left flank. The patient lost consciousness. Upon recovering consciousness he complained of a severe pain in the left side. Signs of intraperitoneal hæmorrhage were absent. Catheterization of the bladder brought bloody urine. Blood persisting in the urine, and a hæmatoma developing in the lumbar region, were the signs which decided Fredet to intervene. A lumbar incision led to the evacuation of a large hæmatoma. Lesions were present on the anterior and on the posterior surfaces of the kidney. The operator thought of nephrectomy, but as the patient had albumen in the urine and had already been treated for nephritis, it was thought that it would be safer to suture the torn kidney. This suture was easy and secured hæmastasis. The patient recovered with a urinary fistula which healed after a time. The patient at the present time is in good health, though the left kidney secretes much less urine than the right. In these cases, it is well that the intervention be conservative. Nephrectomy is only indicated as a late operation when there is a wide-spread infection. By saving the kidney, we preserve a useful organ, though its function is somewhat impaired by the cicatricial bands strangulating some of the parenchymatous elements of the organ.

AIMÉ PAUL HEINECK.

The Surgical Treatment of Tuberculosis of the Epididymis and Testicle. CHAS. GREENE CUMSTON, M. D. *Annals of Surgery*, June, 1909.

This article presents cases and reviews the arguments for and against epididymectomy, concluding that the epididymis is nearly always involved while the corpus remains free, and that the diseased tissue can be removed, although fistulæ in the scrotum have formed. In this way the sexual and mental life of the patient is uninjured.

The author strongly recommends an exploratory incision of the corpus in order to be sure that there is no focus present and also advises the removal of as much of the spermatic cord as is possible.

WM. R. CUBBINS.

The Results of Operation for Cancer of the Tongue, Mouth, and Jaw at the Massachusetts General Hospital, 1890 to 1904. ROBERT B. GREENOUGH, M. D., C. C. SIMMONS, M. D., and ROBERT M. GREEN, M. D. *Boston Medical and Surgical Journal*, May 6, 1909.

These gentlemen review the cases of the Massachusetts General Hospital from 1890 to 1904, in a most thorough manner and leave out all cases of doubtful cure after a doubtful diagnosis. When all has been considered from the early cases with simple operations to the later cases with radical operations including dissection of one or both sides of the neck, there is a large enough margin from immediate death to justify any competent surgeon undertaking the task, and the ultimate complete recovery suggests that as surgical technique is perfected there will continue to be a better prognosis for these cases which have appeared to most surgeons in such an unfavorable light.

In a few cases where there had been a local recurrence and this had been removed by a second operation, the good health of the patient had continued over several years. This seems to be particularly instructive, inasmuch as so few surgeons ever attempt to give surgical help to a case that returns with an apparently local recurrence, or metastasis in a neighboring gland, having drawn the too frequently erroneous conclusion that these local recurrences are simply outsiders to a diffuse general distribution of the tumor.

The authors seem to feel that any interference with the lower jaw adds to the danger of the operation and advise the avoidance of a resection when it is possible.

WM. R. CUBBINS.

Fistulæ Operations in the Tóth Clinic During 25 Years (Die Fisteloperationen an der Klinik während 25 Jahre). S. v. TÓTH. *Abhandlungen an der Gebiete der Geburtshilfe und Gynäkologie*, 1909, h. 1.

Tóth reports 200 selected cases with 84 per cent cured. He believes that an early operation has no advantage and a favorable time should be selected. His successful operations include twenty by repeated operation and one by cauterization of a remaining small fistula. It was necessary to resort to a high closure of the vagina, or kolpokleisis. In nineteen of fifty-two cases of urethra vesicovaginal and vesicocervical fistulæ which is only justified when there is a continence of urine and an intact urethra. The vagina should be closed as high as possible to retain its function and to diminish the size of the retention pouch to avoid a secondary pyometra and pyosalpinx. There is no improvement in the old Emmet technique with the exception of an ingenious method of making an artificial urethra or lengthening of a short one. Two deep cuts from the prominence of the old urethra are made parallel with the urethra about three-fourths of an inch apart and the cut edges united along the middle line make an artificial canal. He condemns making a fistula into the rectum on account of the possibility of infection of the urinary tract.

Trauma in Relation to Malignant Tumors. BLAND-SUTTON. *The Clinical Journal*, 1909, 215.

In discussing the relation of trauma to carcinoma of the breast and the general prevalence among the laity of the opinion that a definite relation exists, Bland-Sutton states that little if any relationship has ever been proven to exist and states that in his opinion such a history can be obtained much more frequently in sarcoma of the breast than in carcinoma. He thinks, however, that "implantation cysts" of fingers, cornea, and iris may be safely regarded as traumatic in origin.

C. G. GRULEE.

Tuberculosis of the Bladder. GRANVILLE MACGOWAN, M. D. *Annals of Surgery*, June, 1909.

Dr. MacGowan reports three cases of tuberculosis of the bladder where the lesions were of a fungoid type,

and of such size as to cause severe obstruction with retention of urine. They presented in addition to these changes the usual symptoms of a tubercular bladder with other small ulcers in different stages of healing.

The careful removal of the growths followed by various other means were successful, at least temporarily, in two cases. WM. R. CUBBINS.

The Operative Treatment of Old Dislocations of the Elbow (Die operative Einrenkung veralteter Ell enbogenverrenkungen). J. DOLLINGER. *Zeitschrift für Chirurgie*, t. 100.

This is a carefully constructed clinical account, dealing with 34 cases of old elbow joint dislocation. Dollinger tried bloodless reduction early in his experience, but he found the method of no avail in cases of longer duration than 3 weeks; so he now invariably proceeds with operative measures in all cases of more than 3 weeks' standing

It is useless to attempt to reapproximate the bones, without division of at least the external lateral ligament. Failure to carry out this step often results in traumata to the joint cartilages, of a very serious nature. Dollinger's technique is as follows: A 12 cm. incision is made along the outer lateral aspect of the upper arm, ending over the external epicondyle. This incision is carried down to the humerus, between muscles planes. The external epicondyle, with the attached external lateral ligament, is chiseled off and turned downward. This furnishes a free exposure, through which the bones may be dislocated, and carefully inspected. If necessary a resection may be done, or diseased portions removed. If not, the bones are reduced, and the arm and forearm immobilized at an angle of 90°, after the external epicondyle has been sutured back in place. The functional results have been excellent. M. G. SEELIG.

Relief of Urinary and Genital Conditions Through Surgery of the Seminal Vesicles. EUGENE FULLER. *Medical Record*, 1909, lxxvi, 717.

After describing the operations of vesiculotomy, the writer mentions a number of conditions and symptoms at times cured by vesiculotomy, among them neurasthenia and hysteria, chronic urethral discharge, chronic sexual excitement often accompanied by priapism, etc.

In all, he has done the operation 126 times with no mortality. In seven tubercular cases no benefit, probably distinct harm in some of the cases. Three other cases were not benefited. All other cases were cured or distinctly benefited. Of those benefited 35 were of rheumatism (the writer questions the right to designate these cases gonorrhœal), 15 or these were acute, of which 13 were cured and 2 relieved. Three subacute cases, 2 cured, 1 tubercular. Five chronic, 3 cured, 1 permanently relieved, 1 temporarily relieved. Eight very chronic, 4 cured, 2 greatly relieved, 1 troubled with an aortic lesion — course not mentioned, 1 had recurrence after 6 months. C. G. GRULEE.

Joint Transplantation (Über Gelenk transplantation). ERICH LEXER. *Arch. f. Klin. Chir.* b. 90, h. 2.

Lexer introduces his paper with the statement that since his first publication on joint transplantation, in 1908, he has improved the technique, and has come to believe that the operation has a future. The incision must be so planned that when the new joint is transplanted the suture line does not overlay the site of bone contact. The new joint should fit fairly closely and accurately in its new bed, and for this reason, it is best that the bone ends be cut directly across, at a right angle to the long axis. No joints should be used that might in any way infect the individual on whom the transplantation is to be done. Lexer has, so far, transplanted joints only from patients who were obliged to lose their legs as a result of trauma, or dry angiosclerotic gangrene. He states that it might be possible to use the joint of a very fresh (within 24 hours) cadaver, but that he has feared to try such material, owing to the danger of infection.

The proper preparation of the new joint (the one to be transplanted) is of the greatest importance. All ligaments, tendon insertions, fat, and muscles must be removed. The crucial ligaments and the cartilages need not be removed, for they do not show any tendency to undergo necrosis after transplantation. No antiseptic or aseptic fluid is used during the transplantation. Whether the joint capsule should be removed is a point which Lexer has not yet definitely decided. In his most successful case, he transplanted the joint, after first removing the capsule.

It is of importance to know that foreign bodies (nails, wire, ivory pegs, etc.) can not be used to fix the new transplanted joint in place; for the granulation tissue which develops about these foreign bodies grows into the bone and absorbs it. The joint may be fixed in place by wedging, or by the use of bolts made of fresh bone. Muscle plastic of some sort is necessary to insure good function, and of these operations, probably the most simple one is to substitute the flexors of the knee for the extensors (which are usually most atrophied and least likely to be useful).

As regards after treatment, movements are not permitted until union is firm, and the X-rays show good callus. Massage, baths, and exercises are used in the ordinary way. M. G. SEELIG.

Cholecystostomy in the Heidelberg Surgical Clinic During the Years 1901-1906. DR. WILHELM MACK. *Beiträge zur Klinischen Chirurgie*, vol. lvii.

During the time noted, 427 cases of operation on the biliary tract were done in the clinic, of which 210 were cholecystostomies. Notes on 139 cases are appended.

Primary mortality. In 162 cases, in which no other operation than cholecystostomy was done, 5 deaths occurred or a mortality of 3.1 per cent. In 197 cases of cholesyctostomy, or cholecystostomy together with a duct operation, the mortality was 5.1 per cent.

Sex. 90.5 per cent of the operations were upon

women, total number of operated women being 124. Stones were found in 114 of these.

Age. The average age was 38.2 years. Mack notes a case of gall-stone symptoms in a boy of 8 years.

Subsequent condition. 86.1 per cent were improved. In 67.9 per cent the patients were able to work as well or better than before. Trouble in other organs was lacking in only 46.7 per cent and had its bearing on the subsequent condition of the cases, as many still suffered from other things after complete recovery from gall-bladder trouble.

Fistulæ persisted in 4 cases (2.9 per cent). Post-operative late abscesses occurred in 2 cases (1.5 per cent).

Herniæ. These occurred in 20.4 per cent of all cases. It was noted in 30.8 per cent of the males and 19.4 per cent of the women, hard labor apparently being the cause of the difference. In 30 duct operations 8 cases or 26.7 per cent had herniæ, an indication of the value of early operation. As to the influence of the method of suture, it is interesting to note that of cases in which through and through sutures were used, herniæ occurred in 20.8 per cent. In cases in which tier sutures were used 20.5 per cent of herniæ were noted, thereby upholding Kehr's statement that a tier suture in gall-bladder cases has but little special value.

Absolute freedom from symptoms referable to the biliary tract was noted after operation in 57.7 per cent.

Attacks of pain, colic, or slight pain, with or without icterus, were noted in 34.3 per cent subsequent to operation.

In 13.9 per cent icterus was again noted.

Recurrence. True recurrence only occurs when all stones are removed, of which one can only be absolutely sure in cases of single stone, or few stones, not in cases where many small concretions are present. In simple cholecystostomy 9.1 per cent of recurrences were noted; in empyema 17.6 per cent; drainage of hepatic duct 20.8 per cent. The total of recurrences in 124 cases was 12.9 per cent.

Mack favors an incision through or at the border of the rectus and recommends a strong adhesive plaster dressing. W. C. DANFORTH.

Operative Treatment of Gastric Crises by Resection of the 7-10 Posterior Spinal Roots (Über Operative Behandlung Gastrischer Krisen durch Resection der 7–10 hinteren Dorsalwurzel). O. FOERSTER and H. KEUTTNER. *Beit. z. Chir.*, b. 63, h. 2.

The authors first state carefully their conception of tabetic crises, emphasizing the fact that they are made up both of sensory and motor phenomena. The sensory manifestations are considered as primary, the motor ones as secondary and reflex in nature. The character of the pain in gastric crises is carefully described as are also the reflex motor symptoms (vomiting, singultus, and the secondary hypersecretion of gastric juice and bile).

The sensory symptoms point strongly to the fact that the 7–10 posterior spinal roots are involved. These roots, as is well known, contain fibers which pass over to the sympathetic system, and which serve as bonds of connection between the sympathetic and central nervous system. It is very strongly probable that the irritation set up in the posterior roots may pass to the stomach by way of the vagi.

A case is recited in which gastric crises were prominent features, classical in character, and associated with general abdominal colic. In this case, a two-stage operation was performed, the first stage consisting of an extensive laminectomy. At a later sitting the 7th, 8th, 9th, and 10th posterior roots were divided. After the first stage of the operation the condition of the patient was worse than it had been at any previous time, but after the division of the roots, there was a total disappearance of pain, an increase of appetite and weight, and a general, marked improvement. The authors are careful to state that they do not wish to draw any dogmatic conclusions based on only one case.

M. G. SEELIG.

Tetanus Occurring After Surgical Operations. RICHARDSON. *British Medical Journal*, 1909, i, 948.

Article includes two case reports in which the patients developed symptoms of tetanus after operation. One patient was operated for gall-stones, the other for strangulated, inguinal, omental hernia. Both patients died.

The author suggests that the disease commonly called post-operative tetanus is not tetanus at all, but one of the sheep diseases; that it is not introduced by the catgut; that the patient at the time is the host of the bacillus; and that these are cases of idiopathic tetanus.

The important fact to be determined is whether the infection (whatever it may be) is conveyed by the catgut. The author hopes that infection by the latter may be ruled out. A. B. EUSTACE.

Noma; Seven Cases, Two Recoveries, Forty Infected. L. R. G. CRANDON, EDWIN H. PLACE and WM. J. BROWN. *Boston Medical and Surgical Journal*, April 15, 1909.

After a careful presentation of the cases and their treatment, the authors arrive at the following conclusions:

Noma is not proven to be a contagious disease and need not be isolated. Any uncared-for mouth, particularly in a sick child, and especially in measles, may contain the B. fusiformis and spirochæta gracillis. In such a mouth these organisms may be formed without ulceration, or in the lesions which have been described as stomatitis gangrænosa, Vincent's angina, and noma. In other words, the lesions may only round the roots of the teeth, on tonsils and pillars, on inner sides of the cheek, in nasal fossæ, on the external ear, and about the genitals. Any of these conditions, including the extensive gangrene called noma, may be different stages of the same disease, which may be, therefore, considered as not necessarily a specific disease but the successful ingress of mouth bacteria into tissues rendered non-resistant by uncleanliness and preceding disease. WM. R. CUBBINS.

Experimental Investigation Concerning the Sensibility of the Abdominal Viscera (Experimentelle untersuchungen über die Sensibilitaet der Bauchhoehle). CARL RITTER. *Arch. f. Chir.*, b. 90, h. 2.

Ritter concludes from his experiments, that in the dog, every abdominal organ possesses sensation. It is important, in such investigations not to anæsthetize the animal either locally with cocaine, or for even the shortest period of time with ether or chloroform. In order for any conclusion to be trustworthy, the animal should have no other narcotic than morphine.

On morphinized animals, Ritter has demonstrated that parts poorly supplied with blood are less sensitive than parts where the blood supply is richer. Blood-vessels themselves are the most sensitive of tissues, and furnish, therefore, the best test as to the sensibility of any region. The pain incident upon ligation is greater even than that of irritating the parietal peritoneum or dragging on the mesentery. Sensibility of the viscera is much diminished by allowing them to become dry from exposure to air. The pain is the result of an impulse carried to the brain, through the cord by virtue of its connection with the sympathetic system. It seems fair to assume the viscera of human beings are sensitive in the same measure as those of the dog, and that here also, the main centers of pain are the blood-vessels.

Although this work confirms the opinion of Meltzer and Kast, the author specifically states that the explanations offered by Meltzer and Kast do not hold. It is irrational to suppose that a small dose of cocaine can completely anæsthetize all the abdominal viscera, as Meltzer and Kast assume. Ritter believes, that if after laparotomy, the viscera appear to possess no sensibility the fact is due to a disturbance of the fine sensitive nerves, as a result of the procedures of the laparotomy. M. G. SEELIG.

Solitary Tuberculosis of the Breast. E. M. VON EBERTS. *American Journal of Medical Sciences*, July, 1909.

Dr. Von Eberts reports a case in which the tubercular lesion involved one breast. The patient gave a history of having had a mastitis from years previous which had healed. The present trouble developed upon the old scar. The breast was not enlarged except at site of disease where there was a fluctuating abscess surrounded by indurated tissue. Upon removal the indurated tissue showed numerous typical tubercles. So far the patient has remained in good health.

WM. R. CUBBINS.

The Influenza Bacillus as Cause of Cholecystitis (Der Influenzabacillus als Erreger der Cholezystitis). OTTO KNINA. *Wiener Klinische Wochenschrift*, 1909, xxii, 1234.

The author reports a case and mentions three others found in the literature. In each case the inflammation was secondary and a pure culture of the influenza bacillus was found. C. G. GRULEE.

Aneurisms in Young People. THEODORE A. McGRAW. *Annals of Surgery*, July, 1909.

Dr. McGraw reports two cases of aneurisms, one of which occurred in the brachial artery just above its bifurcation, in a boy of 17, and the other in a boy aged 16, situated in the popliteal space. Both of the aneurisms had ruptured and were surrounded by clotted blood, although the pulsations were strong and a strong murmur present. There was no history of syphilis or any acute infection in either case. The walls of the vessels were thin and delicate, so that the ligatures or sutures would cut through with little or no pressure. There was no atheromatous, calcareous, or necrotic change present in the vessels.

The heart in both patients was markedly enlarged and murmurs were present, and both died later of cardiac weakness.

The literature is also reviewed, and sixty-four cases found. However, the history of these cases does not add anything to either clear up the cause or make the pathology more definite. WM. R. CUBBINS.

Cure of Rectal Prolapse by Tamponade (Heilung des Rectum prolapses durch Tamponade). P. SICK. *Cent. f. Chir.*, No. 36, 1909.

Sick comments on E. Kehorn's recently published method of treating rectal prolapse by suture, and states that the method is neither free from danger, nor certain as to result. Sick states that his procedure is absolutely safe, and may be used in all cases that are not so severe as to demand resection of the prolapsed bowels.

The method in detail is as follows: In the median raphé a vertical incision is made from the tip of the coccyx up to the sphincter. This incision, which does not divide muscle fibers, nerves, or vessels, is deepened down through the superficial and deep fasciæ, into the loose connective tissue behind the rectum. By blunt dissection, the rectum is mobilized as high up as the promontory of the sacrum, and then held upward by means of a gauze tampon inserted between it and the sacrum. The wound is protected from fæcal soiling by covering it with plaster. The gauze is removed at the end of two weeks, and the child not allowed to assume the sitting posture for three weeks.

M. G. SEELIG.

Removal of the Thymus (Ablation du Thymus). VEAUET OLIVIER. *Ann. de Chir. et Med. Inf.*, 1909, xiii, 664.

The writers report two cases, in one of which the removal of the thymus brought immediate relief from a severe dyspnœa, and another in which no relief whatever was attained in an exactly similar case. They regret the fact that as yet we are not able to determine in which cases the enlarged thymus is the cause of the stridor, and think until such a diagnosis is possible that it is best to give the patient the benefit of the doubt and operate. C. G. GRULEE.

Joint Tuberculosis, with Special Reference to its Pathology. LEONARD W. ELY. *Medical Record*, 1909, lxxvi, 551.

The paper records the results of the examination of 48 specimens of joint, 45 bone, and 1 tendon sheath disease. As a result of a careful study of the specimens Ely is convinced that many joint lesions diagnosed tuberculosis are not in fact tubercular. In his specimens the synovial type seemed to be more frequent than the bone type. He thinks that since every effort of tubercular joint seems to be toward fixation, that our treatment should tend to take advantage of the suggestion nature gives us. He also emphasized the fact that operation where necessary should be adapted to the individual case. C. G. GRULEE.

The Value of Serum Therapy in Hemophilia Based upon Experimental and Clinical Examinations (Der Wert der Serumbehandlung bei Hämophilia auf Grund experimenteller und klinischer Untersuchungen). DR. ERNST W. BAUM. *Mitteilungen aus den Grenzgebieten der Medizin und Chirurgie.*

Following the work of Broca and Weil the author endeavors to supply to the hemophilic blood, normal serum carrying the normal elements directly concerned in the process of coagulation.

In his animal experiments he renders the blood of rabbits non-coagulable by the injection into the jugular vein of leech-extract, thus producing a condition closely resembling hemophilia. Blood is then taken from the carotid artery of the opposite side and its coagulation time measured. More blood is then taken, to which is added three drops of serum, and the coagulation time also measured. By this means the blood which, without the serum, coagulated only after three hours and 15 to 30 minutes, was seen with the addition of serum to coagulate in 10 to 54 minutes.

In further experiments both with the addition and injection into the animal of serum, while some influence upon the coagulation time was noticed, the results were not constant and his explanation was that when the effect of the leech-extract was sufficient to entirely destroy the coagulation power, the addition of serum either by injection, topical application, or addition outside of the body, had very little effect upon it.

The experiments with intravenous injection, topical application, and local injection into the neighborhood of a wound in a patient suffering from hereditary hemophilia, showed quite the same results, viz., that the results were not constant and could not be entirely depended upon. On the other hand, the sporadic forms of hemophilia seem to be markedly benefited as his report and those of Weil and others show.

In experiments upon patients suffering from hemophilia, human and rabbit serum was injected intravenously, but for topical application and tamponade antidiphtheretic and antistrepticoccic serums were also used.

The author quotes Weil as saying that the effects produced by human, horse, and rabbit serum were about equal but he advises against the use of bovine serum as some constitutional disturbances follow its use for injection.

The author's conclusions are that in the cases of lighter form in which the power of coagulation is not greatly interfered with, serum therapy may be used with success, both as a prophylactic before necessary operations and as a curative agent, especially in hæmorrhages into the joints. In the severe hereditary forms he would place little dependence upon it as a prophylactic before operation. H. A. POTTS.

Volkmann's Contracture. NATE GINSBURG. *American Journal of the Medical Sciences*, cxxxviii, No. 4.

The author reviews the etiology, symptoms, and diagnosis of the malady and draws the following conclusions:

1. The specific underlying factor producing a Volkmann's contracture is still a matter of great dispute; but the evidence seems to warrant the assumption that it is a deformity in which muscle, nerve, and tendon structures share. Early, and probably primarily, the nerve injury shares the same injury which induces muscle anæmia with subsequent myositic degeneration. The contracture is the result of myositis, with accompanying nerve lesion, and may vary from a transient type to that of a hopeless deformity.

2. The deformity follows, in most cases, too tightly applied dressings for fractures of the forearm or humerus in the region of the elbow joint, in children under the age of fifteen years. Usually the pressure has been of sufficient intensity to produce a pressure sore, which is present in 80 per cent of the cases. It may arise in less than 24 hours, or be delayed for many days.

3. Severe pain, followed by numbness, discoloration of the hand with bleb formation, and contraction of the fingers are first noticed. Later, the characteristic flexion of the fingers at the interphalangeal joints, with flexion of the hand at the wrist, and marked pronation occur. Some flexion at the elbow is usually present.

4. Careful application of dressings, with frequent inspection, is the best prophylactic measure. Prompt recognition of the symptoms, with measures to restore the hand to its normal appearance, constitute the safest means of obviating the subsequent development of what may prove to be an irremediable condition.

Active and passive motion, massage and electricity, with permanent removal of the splint, should be advised if deemed necessary.

5. Operative treatment depends upon the individual case. No specific procedure can be suggested, but tendoplasty and resection of both bones of the forearm are the two methods of operative treatment offering the best chance of recovery of the use of the hand. The nerves should always be examined to determine the extent of the involvement, and should be freed if necessary.

6. The prognosis is unfavorable depending upon the duration of the case and degree of involvement of the damaged structures. Partial recovery is not unusual in cases seemingly hopeless in the beginning.

ARTHUR B. EUSTACE.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. Bacon, M. D. — Ralph Waldo Lobenstine, M. D.
Heliodor Schiller, M. D. — C. G. Grulee, M. D.

Rupture of the Uterus (Über die Zerreissung der Gebärmutter an der Hand von 91 eigenen Fallen). E. Scipiades. *Abhandlungen an der Gebiete der Geburtshilfe und Gynäkologie*, h. 1.

According to Scipiades uterine rupture occurs once in 2,000 cases of labor. Two-thirds of these occur spontaneously, and the other third are traumatic. In about three-fourths of all cases the rupture is complete. The left side of the lower uterine segment is most frequently disposed to rupture. In the ninety-one cases which he reports there was a mortality of 87.21 per cent and a greater fatality for the child. The summing up of his conclusions is to the effect that 93 per cent of the causes of rupture are due to external conditions rather than to the uterus itself. In the hands of the competent obstetrician a rupture is nearly always preventable; consequently the prophylaxis measures are of prime importance. First, the stretching of the cervix with accompanying œdema is unmistakably suggestive. Second, the symptoms of approaching rupture are those of continually agonizing pains, an anxious expression of the face, a symmetrically swollen abdomen, like an enormously filled bladder, and a uterus which never becomes softened. After rupture does occur with the sudden cessation of pains and symptoms resembling internal hæmorrhage, unless there is an uncontrolled bleeding, or it is impossible to deliver the fœtus or the decapitated head per vagina, Scipiades favors the conservative rather than the radical treatment. The former consists of packing the uterine wound vaginally with iodoform gauze, or if the uterus is atonic, pack the uterine cavity and vagina and put on abdominal bandages. This packing is allowed to remain forty-eight hours to eight days, it is then cautiously replaced with a glass drain, and finally with a small fenestrated rubber tube.

When rupture has once occurred the possibility of a future conception should be prevented when possible. If this has occurred and she comes early enough, bring on an abortion. But if seen too late and there is a possibility of a living child, a Cæsarean section must be done.

Intracranial Hæmorrhage in the Newborn. James R. Torbert, M. D. *Boston Medical and Surgical Journal*, April 22, 1909.

Dr. Torbert reports two cases in which he was able to make the diagnosis of intracranial hæmorrhage, and urges the more careful examination of children in which there is early trouble with the nervous symptoms. The most marked symptoms in these cases were those of intracranial pressure, a bulging anterior fontanelle and blood in the cerebrospinal fluid. The pressure symptoms were not definite enough to make a marked focal finding in either case, but the author feels that with a very fretful child these other symptoms should be sought for. One case followed a prolonged labor in a primipara in which low forceps were used without visible trauma and which did not develop until the fifth day. This case showed stupor from which it could be aroused. The limbs were held at an abnormal tension but were moved alike on both sides. There was no exaggeration of the knee jerks and no Babinski, the pupils were equal and there was no twitching of the face. There was no subcongenital hæmorrhage, but the fontanelle was tense and did not pulsate. Lumbar puncture gave a bloody fluid.

The second case was in labor five hours, perfectly normal. On the second day he was fretful and the right side of the mouth and face twitched. An hour later he had a convulsion, the fontanelle was tense and bulging, the child cyanotic, and he died very suddenly a few minutes later. Neither case came to operation.

Wm. R. Cubbins.

Compression of the Aorta in Post-partum Hæmorrhage Due to Uterine Atony (Assistenza all, emorragia post-partum per atonia dell' utero. Compressione dell' aorta abdominale). Edoardo Paggi. *La Clinica Ostetrica*, x, fasc. 15, 1908.

Three cases of post-partum hæmorrhage are reported by Paggi. In one of these massage, bimanual manipulation, intrauterine douching at 50° C., and tamponade all were in vain and the patient was lost. In the other two compression of the abdominal aorta was employed with excellent results. In one of these after a few hours of such control, the hæmorrhage ceased; in the other there was no return after fifteen hours of intermittent control. In all three cases the hæmorrhage was due to atony of the uterus. As a result of his experience, Paggi contends that compression of the abdominal aorta is not only of great practical value in the management of this complication, but that it has a scientific basis as a method of treatment, being compression of the largest afferent vessel at the seat of election when the wounded point cannot be reached,

a fundamental surgical principle analogous to pressure on the brachial artery in hæmorrhage of the palmar arch. The practical advantages are (1) that compression is more efficient in severe hæmorrhage than other more usual methods; (2) that it is easily carried out; (3) that it requires no special instruments nor expert assistants; (4) that it may be employed without preparations in the most miserable homes. The disadvantages are (1) that the compression may have to be continued for several hours, thus requiring the assistance of two or three attendants acting alternately, and (2) that the constant supervision of the accoucheur or midwife is necessary. CAREY CULBERTSON.

The New Era in Obstetrics and the Use of Vaginal Cæsarean Section in Contracted Pelves. DÜHRSSEN. *Beiträge zur Geburtshilfe und Gynäkologie*, b. XXX, h. 1.

The surgical era in obstetrics has not changed the first and most important indication in obstetrics; to interfere only when mother or child is in danger. Vaginal Cæsarean section is indicated in all cases in which immediate delivery is desired, where the cervix is not obliterated and rigid, and where disproportion between head and pelvis does not exist; in short, where the obstacle is in the soft parts. It is indicated in all cases of premature labor, between the twenty-eighth and thirty-fourth weeks, where there is danger to the mother or child, for instance, eclampsia, and the cervix still rigid. It is indicated in cases of placenta prævia where there is a very severe hæmorrhage and the cervix tightly closed. In general, however, we should try in such cases to rupture the membranes. Should this step not stop the hæmorrhage, we should dilate the cervix slightly, insert a Champetier's bag, using constant elastic traction and finally perform version. The vaginal Cæsarean section is easier on the mother than craniotomy. For the outcome of the vaginal section a deep vaginal perineal incision is important. This exposes the cervix and makes strong traction upon the portio unnecessary.

The combination of metreurysis with the vaginal section greatly simplifies the operation. Extraperitoneal Cæsarean section has only one advantage, the extraperitoneal route, but this is far better insured by the vaginal method. In infected cases it surpasses any other method. It allows the best drainage as no sutures are then applied. Incision in the anterior wall only endangers the life of the child, while the mortality of the children in this operation is very small.

For cases with contracted pelvis or not aseptic cases, Dührssen or his assistant Solms, advises a combination of the vaginal Cæsarean section with a lateral supra-symphysar incision. The operation starts with an incision beginning in the middle line towards the spina ilei sup. through skin, fascia, or muscles, not rectus, working its way subperitoneally from the lateral towards the middle, through the subperitoneal tissue, we obtain access to the bladder and the lower uterine segment. Now follows the vaginal section through the anterior wall only and as far upward as necessary to deliver the child. The authors claim that this method gives better drainage than other extraperitoneal methods and allows one to operate with certainty, an advantage in infected cases. The time for this operation is best before rupture of the membranes, in infected cases, as soon as we see them. Hebeotostomy ought not to appear in obstetrical text-books.

Two remarks of the author seem very important; namely, that nursing of babies by their mothers and proper hygienic care of them during the first year will save ten times more children than the most ingenious and complete surgical therapy in obstetrics. Mothers with contracted pelves to some extent, or abnormal cases, belong in the hospital before labor begins.

HELIODOR SCHILLER.

Hydronephrosis in the Infant with Report of Case. C. G. GRULEE, M. D. *Pediatrics*, March, 1909.

Grulee reports an interesting case of hydronephrosis in an infant. He states that this condition may be congenital or acquired. The differentiation is important as the congenital form is more frequent in infants and is less curable. The etiology of the congenital form consists, first, of malformations of the ureters, second and third, compression and anomalies of the ureter, and fourth, anomalies of the urethra causing distention of the bladder and double hydronephrosis. The acquired form may be caused by pressure on the ureter, by tumors or renal calculi, and uratic dust which is not infrequent in infants.

Diagnosis. Hydronephrosis in the stillborn infant may cause dystocia, due to the large abdomen of the fœtus. In the living child there is the presence of a fluctuating abdominal tumor which in some cases disappears suddenly, and is located in the lumbar region behind and external to the colon. This may be associated with vomiting, diarrhœa, ureteral colic, and sudden fluctuation of weight. Cystoscopy is out of the question. In Grulee's case the symptoms simulated marasmus but the autopsy showed phosphatic calculi in the right kidney, the bladder distended and hypertrophied, and a tight prepuce which when loosened allowed the urine to flow. Both ureters were normal. The pelvis of the right kidney was dilated more than the left, and when the white sand-like calculus was removed, the urine flowed in the right ureter. There was no obstruction in the left ureter.

Treatment. Nephrectomy in unilateral cases.

The Treatment of Osteomalacia. OGATA. *Beitrage zur Geburtschilfe und Gynäkologie*, b. XXX, h. 3.

Ogata strongly advises castration. In fifteen cases, among them six multiparæ, he obtained the most gratifying results. Immediately after the operation the pains subside and disappear completely in a fortnight. The tenderness also disappears as well as the contraction in the muscles. After two weeks, all of his patients were able to walk, and after a few months they walked normally. Some of the cases he observed three years after the castration. Castration should be performed after internal medication fails.

HELIODOR SCHILLER.

The Superficial Tension of the Urine during Pregnancy, Labor and the Puerperium. Dr. Stefano Rebaudi. *La Genicologia Moderna*, June, 1909.

Tension or superficial contractility is that property of liquids which enables them, when left alone, to assume a spherical form and to reduce their free surface to a minimum.

The periphery of the liquid thus seems to assume the characteristics of an elastic membrane, having a tendency to contract. The superficial tension of different liquids varies greatly. Liquids of equal or nearly equal tension, if brought in contact with one another, readily mix, whereas liquids of marked unequal tension do not do so. The tension of distilled water is used as standard, tension of organic liquids is greater or less than that of water.

As all organic fluids are merely aqueous solutions, Ribaudi tried to determine, in different series of cases, which chemical substances caused hypertension and which caused hypotension.

Various methods have been proposed and used for determining the superficial tension of liquids.

1. Determination of the different level attained by immersion of a capillary tube in the liquid to be examined. The level of the liquid in the capillary tube was found to be higher or lower than that of the larger container.

2. By weighing a drop of the liquid. It is a known fact that a drop of liquid will become detached and fall as soon as its weight is equal to the product of the superficial tension of the liquid multiplied by the circumference of the base of the drop. If the circumference of the latter remains the same, its weight will be directly proportionate to its superficial tension.

3. By observing and recording the number of drops which fall from a capillary tube of standard dimensions, in a given time. The volume of each drop being in direct relation to the superficial tension of the liquid, any modification of this tension will modify the number of drops which will fall in a given time. On this principle is founded the stalagmometer of Traube which Rebaudi has modified into a curved siphon-stalagmometer.

Experiments proved that the number of drops is in inverse proportion to the superficial tension of the liquid examined.

The drops are made to fall into a cylinder of small caliber and graduated. By this means drops and fractions of drops can be estimated with a minimum of error. The standard for comparison is the number of drops of sterilized water which will drop in a given time at a temperature of 15°C. The question of temperature is an important one as the superficial tension of a liquid is in inverse ratio to its temperature. A second important point is a determination of the specific gravity of the liquid. The formula Rebaudi uses is as follows:

$Y = 7.305 \frac{zw}{s}$. 7.305 is the superficial tension of pure distilled water. Y and z represent respectively the specific gravity and the number of drops of the liquid under examination, and z w the number of drops of sterile water. Rebaudi's experiments were carried out on 39 women, all of whom were in constant attendance in the obstetrical clinic of Genoa. The specimens for observation were all of the 24 hour variety. These specimens were obtained through catheterization only during labor and the puerperium. All specimens were primarily examined in regard to their quantity, specific gravity, and color, then filtered and tested for albumen, glucose, indican, urobilin, and salts. Specimens from every case were examined every five days during pregnancy; every hour during the three stages of labor.

Tabulated results showing the average superficial tension of urine during pregnancy:

First to second month, 6.63 to 6.71.
Third to fourth month, 6.39 to 6.46.
Fifth to sixth month, 6.20 to 6.31.
Seventh month, 6.18 to 6.24.
Eighth month, 6.12 to 6.21.
Ninth month, first half, 6.10 to 6.19; second half, 6.07 to 6.17.

Superficial tension of urine during labor:

First stage: Multipara, 6.02 to 6.11; 5.91 to 6.07. Primipara, 5.87 to 6.03.

Second stage: Multipara, 5.85 to 6.05. Primipara, 5.76 to 5.93.

Post-secundine period:

3 to 5 hours, 5.91 to 6.08. 12 to 16 hours, 6.26 to 6.31.

Superficial tension of the urine during puerperium:

First day, 6.15 to 6.20.
Second day, 6.12 to 6.17.
Third and fourth days, 6.07 to 6.13.
Fifth day, 6.11 to 6.15.

	Nursing	Not nursing
Sixth day	6.19–6.21	6.20–6.25
Seventh day	6.26–6.31	6.29–6.37
Eighth day	6.34–6.37	6.36–6.42
Ninth day	6.38–6.42	6.45–6.51
Fifteenth day	6.76	6.88

From the above observations Rebaudi concludes:

1. During normal pregnancy, the superficial tension of the urine is less than that in the non-pregnant state. This decrease is more marked during the latter months of pregnancy (i. e., 6.63 to 6.71 as compared with 6.07 to 6.17). It was also noted that this decrease was most accentuated at each menstrual epoch.

2. During labor the superficial tension is lowest at the time of the expulsion of the fœtus. Following delivery there is a constant rise in the superficial tension.

3. The decrease in superficial tension is most marked in the protracted labors of primiparæ.

4. Normal superficial tension is restored during the twelfth to the fifteenth day of the puerperium.

5. Normal tension is restored more rapidly in the non-nursing mother. Inasmuch as there is a marked increase in the amount of organic salts (urea, uric acid) during pregnancy, with a corresponding increase in the quantity of bile and bile pigments.

Rebaudi beleives that a study of the percentage of superficial tension may be an indication of the condition of hepatic and renal function during pregnancy.

George de Tarnowsky.

BOOK REVIEWS

MYOMATA OF THE UTERUS. By Howard A. Kelly, M. D. and Thomas S. Cullen, M. B. Philadelphia and London: W. B. Saunders Company, 1909.

This work is an exhaustive analysis of 1,674 cases of uterine myoma and must be considered as the most comprehensive work of the kind yet published. It is a worthy successor of Dr. Cullen's monograph on uterine cancer.

In recent years the writing of text-books in America has been greatly overdone, while publications of this kind have been far too infrequent.

It is to be hoped that the example set by the authors will prove a stimulus to others in all departments of medicine. An enormous amount of material is lost each year because schools and hospitals lack facilities for preservation and investigation. Most of the medical literature of the present day is of an ephemeral character, whereas careful detailed records of individual experience are of permanent value.

The volume under consideration will always be a mine of wealth to future students. The writer desires to express his great appreciation of the authors' investigations.

J. CLARENCE WEBSTER.

PRINCIPLES OF SURGERY. By the late Professor Nicholas Senn. The fourth edition, edited and revised by Emanuel Senn, M. D. and Emanuel Friend, M. D. Philadelphia: F. A. Davis Company.

This great author and student pointed out in the first edition the absolute necessity of a thorough comprehension of the basic principles upon which the treatment of surgical diseases depends, i. e., etiology and pathology, and gave us the fruits of his own investigations as well as the conclusions of other great minds, all endeavoring to arrive at the truth and place surgery among the exact sciences, doing away with much empiricism with which it has long been associated. His subsequent editors brought the work up to date, keeping pace with new discoveries and new methods as they appeared from time to time.

In this edition the endeavor of the editors has been, as was the aim of the author, viz., the establishment and clear recitation of the fundamental principles upon which the science of surgery is based, revising and adding the latest contributions as they have appeared.

The first chapters deal with cell changes as they occur in regeneration, degeneration, and inflammation.

The chapter on pathogenic bacteria paves the way for the study of the manner in which these bacteria affect the organism.

The subsequent chapters deal with special bacteria and their effects upon the body, giving a clear delineation of the symptoms and signs caused by the organisms and their products.

The author's vast experience with tuberculosis makes his observations of this disease especially valuable.

In addition to facts which have been established since the appearance of the last edition are the investigations of Wright and his opsonic work, also those of Bier and his hyperæmia treatment.

HERBERT A. POTTS.

TRAVAUX D'OBSTETRIQUE. By Samuel Gache, Assistant Professor, Faculty of Medicine of Buenos Ayres. Paris: G. Steinheil, 1909.

This volume is a collection of monographs and papers on various obstetrical topics, published as a memorial to Dr. Gache, with an introduction by Dr. C. Sobre-Casas. The first two articles, entitled respectively "La fecondite de la femme dans soixante-six pays," and "Le rachitisme en Ameriéque et son influence en obstetrique," are entirely original with the author and consist in most interesting studies, the first being particularly elaborate in its detail. These papers were originally published in 1904 and 1903. Another interesting study is that of pregnancy and labor in extremely young primiparæ, from thirteen to sixteen years of age. A fourth paper is based on experiences in labor in primiparæ of advanced years. Most of the subsequent articles suggest conventional topics, such as ectopic pregnancy, tumors complicating pregnancy, rupture of the uterus, placenta prævia, chorio-epithelioma, post-partum eclampsia, etc. Among the rarer clinical reports is that of a case of achondroplasia and one of tetanus following abortion. Not the least interesting feature of the volume is the fact that it brings forth evidence of good work done and careful study carried out in a part of the world not abundantly, perhaps not adequately, represented in the literature.

CAREY CULBERTSON.

A TEXT-BOOK OF SURGERY. By George Emerson Brewer, A. M., M. D. Second edition. Philadelphia: Lea and Febiger, 1909.

The second edition of Dr. Brewer's text-book of surgery bears the stamp of a thorough revision and may be said to be a thoroughly representative work on the subject of which it treats. The author has taken advantage of the opportunity in this edition to elaborate many important subjects which were treated too briefly in the first edition, and to add others which were perhaps of equal importance, hitherto omitted.

The aim apparently has been to keep the book in the class of those which occupy the position midway between the brief manuals and the more voluminous treatises, and in order to do this it was necessary to add materially to the former book.

An important innovation has been introduced in the new illustrations, viz., the presentation of gross lesion in colored photographs by the Lumiere process. This adds materially to the accuracy and beauty of the illustrations.

In the chapters on surgical pathology, an effort has been made to present the practical rather than the purely scientific side of the subject, and a great number of the illustrations depict the gross pathological picture rather than that of the microscopical slide.

CAUSES OF DISABILITY. By C. H. Harbaugh, M. D. Philadelphia: The Overbrook Publishing Company.

This volume is designed to tell the physician who wishes to examine for accident companies the qualifications which are required, and details how to meet these requirements, and how to secure an appointment as a medical examiner with accident companies. It takes up accidents, injuries, and diseases covered by the various policies, and is aimed to aid the physician in diagnosing the case, adjusting the claim, and fixing the indemnity, and for those interested in this field of work it will be found a valuable aid.

PRACTICAL OBSTETRICS. A TEXT-BOOK. By Egbert H. Grandin, A. B., M. D. (Harvard), with the collaboration of George W. Jarman, M. D. and Simon Marx, M. D. Philadelphia: F. A. Davis Company, 1909.

This new edition of the well-known Grandin and Jarman text-book on obstetrics appears as a practically new work, since all that is changeable in the art has been made to accord with the progress of the past ten years, and since the entire subject of the surgery of midwifery has been rewritten in the light of the consensus of views of experts all over the world.

The work, coming from trained teachers, should appeal to the teacher as well as to the student and practitioner. Neither theory nor hobby enter into the text, the book being absolutely practical in detail.

New illustrations and plates have been introduced which elucidate the more recent advances. In appearance the volume reaches the high standard long established by the publishers. CAREY CULBERTSON.

OBSTETRICS. By Joseph B. De Lee, A. M., M. D., with collaboration of Herbert M. Stowe, M. D.

GYNECOLOGY. By Emilius C. Dudley, A. M., M. D., and C. von Bachellè, M. S., M. D. Chicago: The Year Book Publishers.

These volumes of the Practical Medicine Series comprise about 230 pages each, with illustrations, and review the most important advances in the fields of obstetrics and gynecology, respectively. Of special mention is the fact that suprasymphysical Cæsarean section and Cæsarean for placenta prævia are being strongly advocated and practiced especially by the Germans. Chemical conditions of the blood and biological changes are also occupying the attention of many obstetricians. These considerations and many other additions to the science are reviewed in this volume.

DIE GEBURT BEI ENGE BECKEN. By Dr. E. Scipiades Assistant in the Royal University Women's Clinic in Budapest. Berlin: S. Karger.

The first section of the book deals with the literature of this subject. The following procedures are discussed: Prophylactic version, high forceps, the Prochownik diet, Walcher position, Hofmeier impression, craniotomy, induction of premature labor, Cæsarean section relative and absolute, symphysiotomy and pubiotomy. The cases are admirably classified and comprise 949 cases of contracted pelvis, of which about 76 per cent or 228 delivered spontaneously. Prophylactic version receives scant consideration and as the author justly remarks is apparently of more theoretical than actual worth, as evidenced by the surprising deficiency of these cases reported in comparison with other methods employed in the large clinics. He believes the Prochownik diet of considerable value in pelvic contraction of the first and second degree, also old primiparæ, particularly with an intelligent patient. The Walcher position is held to be not practical and the author is not convinced that there is an anatomical lengthening of the c. vera in this position. The Hofmeier impression is preferred to low forceps where the head has passed the inlet; by reason of the lesser maternal morbidity, but this we may take exception to as the writer admits the danger of premature separation of the placenta in this manipulation. In discussing high forceps the statement is made that the percentage of grave maternal injuries is less than in craniotomy — further, that more patients have an afebrile puerperium and leave the clinic with intact genitalia after high forceps than with craniotomy. The author elucidates the foregoing somewhat by the statement that while cervix and perineal lacerations are more frequent with high forceps, the graver injuries such as rupture of the uterus and fistulæ are unknown. To this we must take serious exception nor can we concede that a febrile puerperium is less frequent after high forceps than after craniotomy. The discussion of prematurely induced labor is excellent and worthy of serious study. Pubiotomy is declared to have a permanent place in certain cases although at present it will not displace the relative Cæsarean as its technique is not as perfected nor is it as safe for the child. Maternal mortality is about the same in both operations.

H. K. GIBSON.

BOOKS RECEIVED

THE PRACTICAL MEDICINE SERIES. By G. P. Head, M. D., Editor. Volume VII. Pediatrics and Orthopedic Surgery. Isaac Abt, M. D. and John Ridlon, M. D. Series 1909. Chicago: The Year Book Publishers.

A SYSTEM OF OPERATIVE SURGERY. Volume II. By various authors; edited by F. F. Burghard. London and New York: Oxford University Press, 1909.

SURGICAL DIAGNOSIS. By Edward Martin, M. D. Philadelphia: Lea & Febiger, 1909.

TUMORS OF THE KIDNEY. By Edgar Garceau, M. D. New York and London: D. Appleton and Company, 1909.

CORRESPONDENCE

OVARIAN PREGNANCY

EDITOR SURGERY, GYNECOLOGY AND OBSTETRICS:

Dear Sir: — It has recently been brought to my attention that my abstract of Dr. Jacobson's report of an ovarian pregnancy which appeared in a recent number of SURGERY, GYNECOLOGY AND OBSTETRICS, might in some ways be construed as doubting the authenticity of his case. Nothing was further from my intentions than to cast any reflections on Dr. Jacobson or to question the correctness of his diagnosis The fact that his case was abstracted and placed in my list of positive ovarian pregnancies should be sufficient proof that I believe his case one of true primary ovarian gestation.

Sincerely yours,

C. C. NORRIS.

Philadelphia, October 29, 1909.

TAIT'S OPERATION FOR COMPLETE LACERATION OF THE PERINEUM

EDITOR SURGERY, GYNECOLOGY AND OBSTETRICS:

Dear Sir: — In the September issue of your journal, Dr. H. Banga gives such a new version of Lawson Tait's operation for complete tear of the perineum, and reports his results so satisfactory that both doctor and patients are satisfied with the good results it brings, that no one could censure him for not forsaking an operation that has withstood the sobering effect of experience.

But for some reason this operation has not been so satisfactory in the hands of many of us, who have used it any number of times, but the fault may have been in the operator, and not the fault of the operation.

The unfortunate woman who suffers from a perineal tear of the third degree should enlist the interest of every one engaged in gynecic surgery.

This note is by no means a criticism of any operation designed to correct this trouble.

I only wish to call attention to an operation, worked out by Dr. G. H. Noble of Atlanta, Ga., and which antedates the so-called "dissecting muscle operation" of Dr. Howard A. Kelly for more than three years.

G. H. Noble's operation is this:

Patient lying on the back, legs and thighs flexed, and thighs resting on the abdomen. Begin the cut at junction of skin and membrane at the point where the top of the perineum originally was. Carry this cut all around the vagina, across the rectum, and end at a corresponding point on the other side of vagina.

Separate membranes up in the vagina, about one and a half inches. Then separate the top of rectum, loose from all adjoining tissues, until it can be drawn out about three inches. An assistant now holds the rectum, to prevent returning to its normal place. The torn ends of the sphincter are now found, and ends freshened, and stitched together with kangaroo tendon, and with some suture is stitched all across where it lies on the rectum. The rectum is now released and is stitched to the raw edges with which it comes in contact.

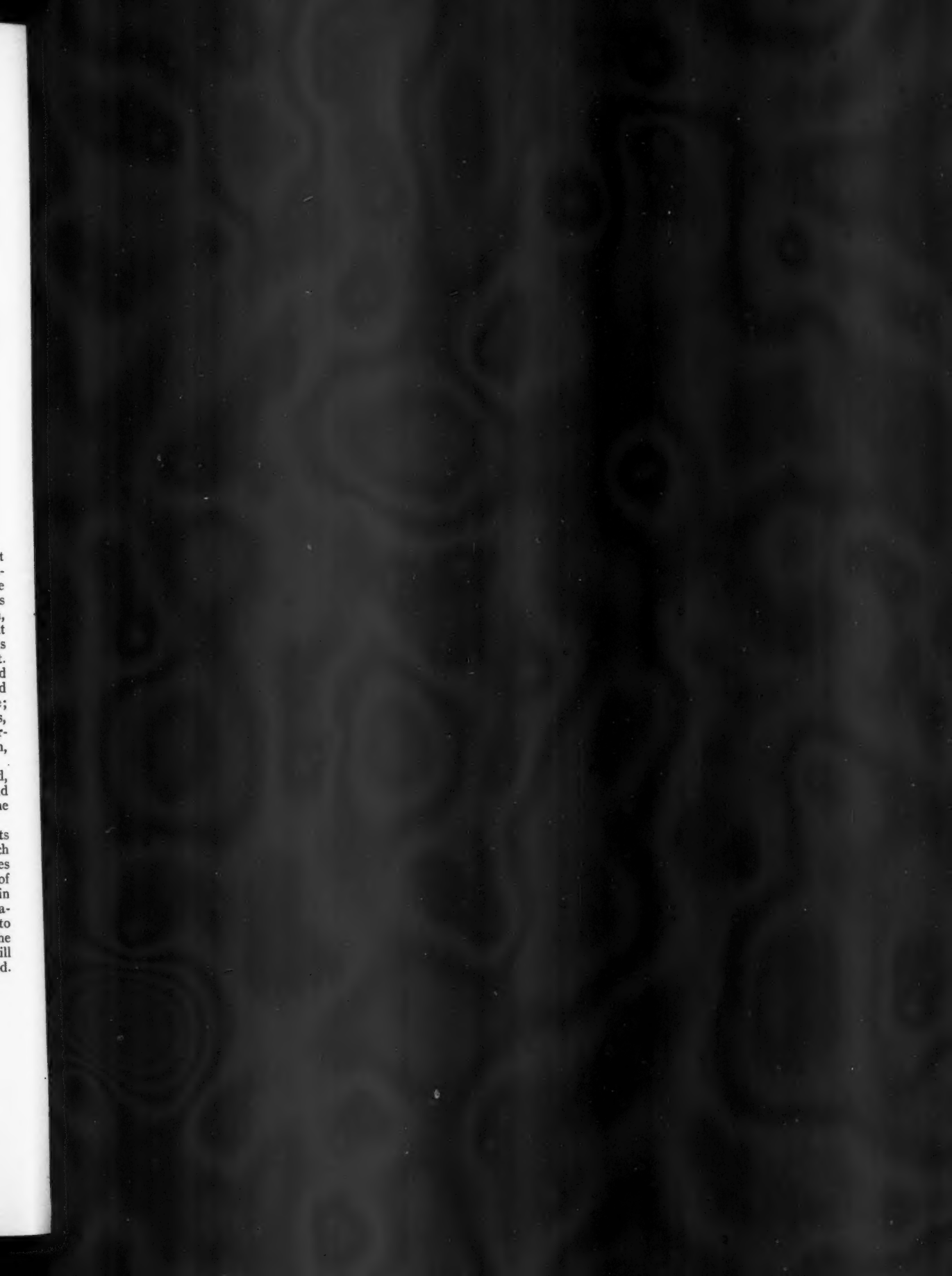
This procedure converts the tear to one of the second degree. The fibres of the levator ani are now found and brought as near over the rectal muscle as possible; a kangaroo suture now unites these separated fibres, as close to rectum as possible, and one or two interrupted sutures, through these muscles and rectum, only increases the possibility of union.

About one inch above this suture another is placed, uniting the fibres of this muscle a second time, and then another is placed at the point intended for the top of the perineal body.

The flap of membrane is now pulled up, and its raw edge is stitched to the raw edge of the skin, which now lies on a line transverse to the body, and the edges of the skin are now pulled over the reunited fibres of the levator ani, and stitched by a number two plain catgut, which completes the operation. This operation is easy to perform — it brings back the tissues to their normal condition as well as position. The membrane flap guards against infection; and it will always be a success — *and not a bit of tissue* is removed.

W. L. NOLEN.

Salem, Va., October 13, 1909.



See Announcement for 1910 on Pages XVIII and XIX

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TABLE OF CONTENTS

ORIGINAL ARTICLES

1. ANATOMICAL CONSIDERATIONS IN PERITONEAL ADHESIONS. *John G. Clark, M.D., Philadelphia, Pennsylvania* 603

2. THE OPERATIVE TREATMENT OF PUERPERAL THROMBOPHLEBITIS. *Joseph Brettauer, M.D., New York City, New York* 608

3. THE ETIOLOGY OF CHOLECYSTITIS. AN EXPERIMENTAL STUDY. *J. Earl Else, Ph.G., B.S., M.D., Pullman, Washington* 612

4. THE RELATION OF THE THYROID GLAND AND THYROIDISM TO THE TOXÆMIA OF PREGNANCY. *George Gray Ward, Jr., M.D., New York City, New York* 617

5. THE DIFFICULTIES OF GALL-BLADDER SURGERY. *J. Norment Baker, B.A., M.D., Montgomery, Alabama* 633

6. A METHOD OF OBTAINING MORE RELIABLE KNOWLEDGE OF THE EXACT AREAS OF PAIN COMPLAINED OF BY PATIENTS AFFLICTED WITH VISCERAL DISEASE. *Philander A. Harris, M.D., Paterson, New Jersey* 638

7. TYPHOID SPINE; WITH THE REPORT OF A CASE. *Jasper Halpenny, M.A., M.D., C.M., Winnipeg, Canada* 649

8. CANCER MORTALITY. *John A. McGlinn, A.B., M.D., Philadelphia, Pennsylvania* 656

9. THROMBI AND EMBOLI—POST-OPERATIVE IMPORTANCE. *Hugh Crouse, M.D., El Paso, Texas* 663

CONTENTS CONTINUED OPPOSITE NEXT PAGE

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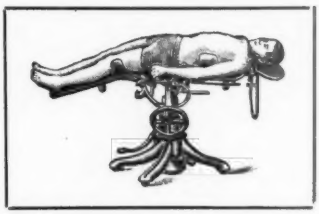

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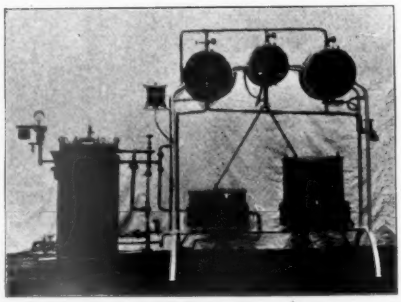

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TABLE OF CONTENTS — CONTINUED

ORIGINAL ARTICLES—CONTINUED

THE EVOLUTION OF OVARIOTOMY IN FRANCE. A CORRECTION. *Samuel Pozzi, M.D., Paris, France* 674

DEPARTMENT OF TECHNIQUE

10. AN APPARATUS FOR ASPIRATION. A DESCRIPTION OF AN APPARATUS USED AT THE NEW YORK HOSPITAL. *James H. Kenyon, M.D., and Eugene H. Pool, M.D., New York City, New York* 675

11. FRACTURE OF THE EMINENTIA CAPITATA. *H. Reineking, M.D., Milwaukee, Wisconsin* 678

12. PSEUDO-HERMAPHRODITISMUS MASCULINUS EXTERNUS. REPORT OF TWO CASES WITH REMARKS ON TREATMENT AND MEDICO-LEGAL QUESTIONS. *Kedarnath Das, M.D., Calcutta, India* 680

13 PROTECTIVE APPENDICITIS AND THE FOURTH ERA IN SURGERY. *Robert T. Morris, M.D., New York City, New York* 685

14. THE USE OF RUBBER ELASTIC BANDS FOR DRAINAGE. *E. Stanley Ryerson, M.D., C.M., Toronto, Canada* 687

CONTENTS CONTINUED OPPOSITE NEXT PAGE

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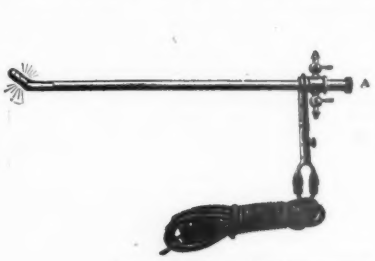

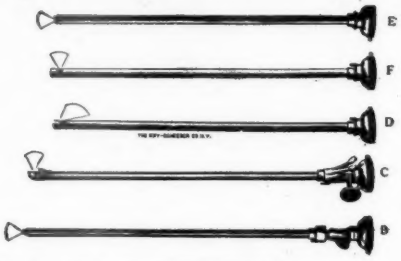

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TABLE OF CONTENTS—CONTINUED

DEPARTMENT OF TECHNIQUE—CONTINUED

15. TWO INTRACTABLE CASES OF VESICO-VAGINAL FISTULA. *E. Sinclair Stevenson, M.D., F.R.C.S., Rondebosch, Cape Colony* 689

16. THE SO-CALLED MURPHY-FOWLER AFTER-TREATMENT OF APPENDICITIS. *George S. Brown, M.D., Birmingham, Alabama* 690

17. TOXÆMIA OF PREGNANCY. REPORT OF A CASE—RECOVERY. *Harry Morell, M.D., Regina, Canada* 693

18. THE TABLE-SIDE STERILIZER. *John D. Singley, A.M., M.D., Pittsburg, Pennsylvania* ... 694

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

Tuberculous Sigmoido-perisigmoiditis 695
Removal of a Gauze Sponge from the Scrotum Two and One-half Years after an Operation for Double Inguinal Hernia 695
The Cammidge Reaction in Experimental Lesions of the Pancreas 695
Bone Transference 695
Traumatic Rupture of the Kidney Treated by Suture 696
The Surgical Treatment of Tuberculosis of the Epididymis and Testicle 696
The Results of Operation for Cancer of the Tongue, Mouth and Jaw at the Massachusetts General Hospital, 1890 to 1904 696
Fistulæ Operations in the Tóth Clinic during 25 years 696

DEPARTMENT OF SURGERY—CONTINUED

Trauma in Relation to Malignant Tumors 696
Tuberculosis of the Bladder 696
The Operative Treatment of Old Dislocations of the Elbow 697
Relief of Urinary and Genital Conditions Through Surgery of the Seminal Vesicles 697
Joint Transplantation 697
Cholecystostomy in the Heidelberg Surgical Clinic during the years 1901-1906 697
Operative Treatment of Gastric Crises by Resection of the 7-10 Posterior Spinal Roots 698
Tetanus Occurring after Surgical Operations 698
Noma; Seven Cases, Two Recoveries, Forty Infected. 698

CONTENTS CONTINUED OPPOSITE NEXT PAGE

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TABLE OF CONTENTS—CONTINUED

ABSTRACTS OF CURRENT LITERATURE—CONTINUED

DEPARTMENT OF SURGERY—*Continued*

Experimental Investigation Concerning the Sensibility of the Abdominal Viscera 699
Solitary Tuberculosis of the Breast 699
The Influenza Bacillus as a Cause of Cholecystitis ... 699
Aneurisms in Young People 699
Cure of Rectal Prolapse by Tamponade 699
Removal of the Thymus 699
Joint Tuberculosis, with Special Reference to its Pathology 700
The Value of Serum Therapy in Hemophilia, Based upon Experimental and Clinical Examinations 700
Volkmann's Contracture 700

DEPARTMENT OF OBSTETRICS

Rupture of the Uterus 701
Intracranial Hæmorrhage in the New-born 701
Compression of the Aorta in Post-partum Hæmorrhage due to Uterine Atony 701
The New Era in Obstetrics and the Use of Vaginal Cæsarean Section in Contracted Pelves 702
Hydronephrosis in the Infant, with Report of Case. 702
The Treatment of Osteomalacia 702
The Superficial Tension of the Urine during Pregnancy, Labor and the Puerperium 703

BOOK REVIEWS

Myomata of the Uterus. Howard A. Kelly, M.D., and Thomas S. Cullen, M.B. 704
Principles of Surgery. Professor Nicholas Senn, Emanuel Senn, M.D., and Emanuel Friend, M.D. 704
Travaux d'Obstetrique. Samuel Gache 704
A Text-book of Surgery. George Emerson Brewer, A.M., M.D. 704
Causes of Disability. C. H. Harbaugh, M.D. 705
Practical Obstetrics. Egbert H. Grandin, A.B., M.D., George W. Jarman, M.D., and Simon Marx, M.D. ... 705
Obstetrics. Joseph B. DeLee, A.M., M.D., and Herbert M. Stowe, M. D. 705
Gynecology. Emilius C. Dudley, A.M., M.D., and C. von Bachelle, M.S., M.D. 705
Die Geburt bei Enge Becken. Dr. E. Scipiades 705
Books Received 705

CORRESPONDENCE

Ovarian Pregnancy 706
Tait's Operation for Complete Laceration of the Perineum 706

INDEX TO VOLUME IX

I. Contributors. II. Subject Index. III. Book Reviews.

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.....WILLIAM B. COLEY, M. D., New York City

Rupture and Wounds of the Pancreas.....JOHN H. GIBBON, M. D., Philadelphia, Pa.

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Serous Spinal Meningitis with Report of Seven Cases..J. C. MUNRO, M. D., Boston, Mass.

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The Diagnostic Value of Distension of the Renal Pelvis Through the Ureteral Catheter....Leonard Freeman, M. D., Denver, Colo.

Intussusception in Children..... J. M. Elder, M. D., Montreal, Canada

The Bier Treatment in Tuberculous Joint Disease.....Leonard W. Ely, M. D., New York City

Noma. Report of a Case That Recovered Without Perforation.....Miles F. Porter, M. D., Fort Wayne, Ind.

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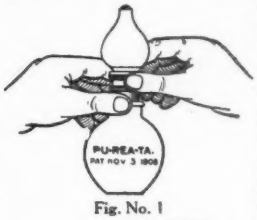

Fig. No. 1

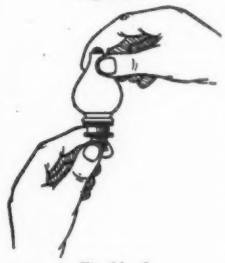
Fig. No. 2

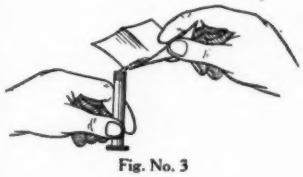
Fig. No. 3

Fig. No. 4

Fig. No. 5

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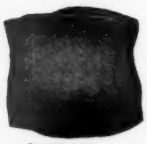
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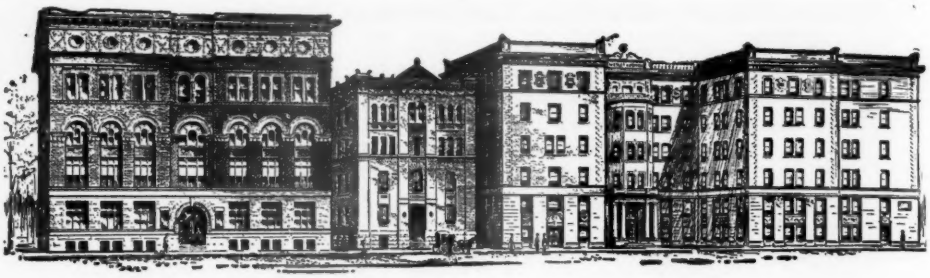

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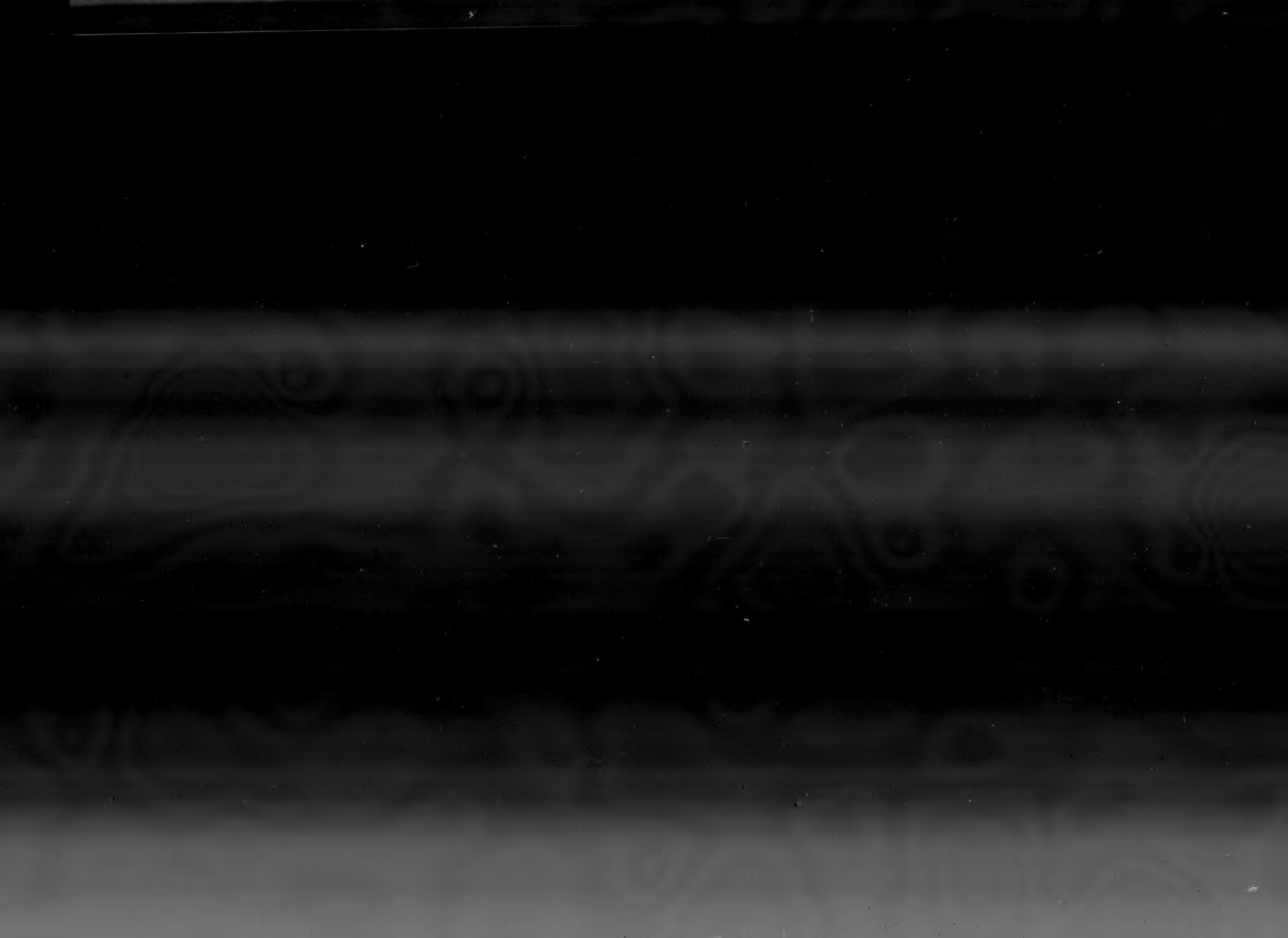

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